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***USSR: Science &
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Academician Moiseyev on Reorganizing Academies

18140260 Moscow MOSKOVSKAYA PRAVDA
in Russian 16 Apr 89 p 4

[Interview with Academician Nikita Nikolayevich Moiseyev, by V. Yegikova under the rubric "Today Is the Day of Soviet Science": "Discoveries on Demand. Our Companion Is Academician Nikita Moiseyev"]

[Text]

MOSKOVSKAYA PRAVDA: Nikita Nikolayevich, on a holiday it is customary to speak about achievements. But we agreed to break this tradition. Obviously, today a discussion of what is hindering the development of science is far more important....

N. N. Moiseyev: I agree. Especially as it is no secret: in many areas of research we have fallen behind, and have fallen seriously behind. This, in particular, was spoken about at the just concluded annual general assembly of the USSR Academy of Sciences. True, in recent times quite a lot has been done to overcome the crisis, but so far very little of the changes have concerned the process that is called the bureaucratization of science.

For nearly 40 years—since I was admitted in 1951 to doctoral studies of the Institute of Mathematics imeni V.A. Steklov—I have been involved with the academic sphere. During these years many observations have accumulated.

You see, the Academy of Sciences up to a certain time was a kind of brotherhood of researchers, precisely a brotherhood—this word may seem somewhat high-flown, but in this case it is very accurate. The times changed, and they left a mark on the Academy: the spirit of collectivity disappeared, the brotherhood of researchers collapsed.... I will try to illustrate this assertion with an example from my own life.

When I had defended my doctoral dissertation, I received several tempting offers. A front-line soldier of yesterday, it was not that easy for me to find my bearings, and I decided to ask the advice of the president of the Academy of Sciences. I came into the reception room of the Academy (at that time this was easy), the secretary of the president heard me out, suggested that I leave my telephone number, and promised to call in the next 2-3 days. In 2 days she actually called and said: Aleksandr Nikolayevich Nesmeyanov (at that time the president of the Academy) was willing to receive me. The meeting took place at the appointed hour, Aleksandr Nikolayevich helped to settle my doubts—thus began many years of work at the Computer Center of the USSR Academy of Sciences.

I spoke with the president as an equal, as a junior member of the brotherhood of researchers, and not as a subordinate with a chief. Many years have passed since

then. For nearly a quarter century I worked as deputy director of the Computer Center of the Academy and more than once had occasion to fulfill assignments of the president or other academy leaders. So, it happened, for months I was not able to arrange a meeting in order to clarify some question or other....

I do not want to accuse anyone. The process of bureaucratization to some extent does not depend on the individual. For example, at the Academy there are departments, and an academician secretary supervises each one. In addition to this very difficult duty he also has a large number of others—as a rule, he is still in charge of an institute and several councils and may also be a vice president of the Academy. Any of these duties would be over the head of a person of ordinary abilities. But it is not that easy for even a very talented individual to take in the entire set of matters that are engrossing him. Here there is already a root, and a deep one, for the growth of the bureaucratic mechanism.

Moreover, at the Academy many so-called organizers of science have appeared in recent decades. The fact that they are essentially not researchers, but administrators, could not but leave its mark on the atmosphere among scientists.

MOSKOVSKAYA PRAVDA: Do you believe that organizers of science are not needed?

N. N. Moiseyev: I am speaking not about the fact that within the Academy there is no place for those who are engaged in administrative work, but that they should be elected to the Academy not on account of their position, but in accordance with the corps of researchers—this is what is extremely important! And the violation of this principle is very significant. Precisely it led to the destruction of the democratic foundations of the Academy and contributed to the appearance of different kinds of inequalities.

It is not a question of the remuneration of labor: the fact that we receive different amounts of money for the performance of different duties, is quite natural and legal. I have in mind the additional benefits and privileges, which are a supplement to the position and underscore the rank, not the contribution to science. For example, precisely the rank makes it possible to receive treatment or vacation under special conditions and to enjoy greater benefits. Such a division should not exist among researchers, if the Academy of Sciences wants to remain a unified whole, a unified organism, of which institutes with their scientific potential are an integral part. Not without reason have they begun to call the Academy more and more often "a ministry of science."

What, in my opinion, is it necessary to do in order to change the situation and to restore the notion of the Academy as a unified brotherhood of researchers?

It is my deep conviction: decentralization and the shifting of the emphases to the republic academies are necessary; moreover, of course, the RSFSR Academy of Sciences should be restored. It is not needed in the form in which the union (or, as they still call it, the "Moscow") academy exists. A council of academies would perform its role, it would specify the most important all-union scientific programs, their formation, and the monitoring of their fulfillment and would assume the functions of a union scientific fund. This would make it possible to change much and to a significant extent would democratize the situation at the Academy....

The second step, which it is necessary to take when the first exists, is to eliminate the division into "first- and second-rate" researchers, which the "two-stage" membership in the Academy essentially is. The difference in the titles of corresponding member and academician finds expression by no means only on the material level. Here, too, the title very often determines the possibilities. Precisely the title, and not the potential abilities of a person! But quite frankly, having discarded our vanities, we should admit: each of us completed our most significant works long before we were awarded an academic office. Another bureaucratic prerequisite for a hierarchy in the scientific world is established here.

And, finally, the third thing. There formed in our country a completely abnormal situation, when science and education were essentially isolated. When the bulk of scientists, who conduct basic research, were cut off from the higher school. We are not that rich to allow ourselves to have two corps of scientists: one for research work, the other for teaching work. The departmental barriers, which at one time separated science and education, struck an enormous blow both to the level of research and to the training of personnel.

MOSKOVSKAYA PRAVDA: That is why today much attention is being devoted to the integration of science and education.

N. N. Moiseyev: Yes, it is very important that today an understanding of this problem exists. Now it is a matter of practical steps, but here thus far the experience that has been gained is very little. An understanding of the problem exists, a desire to solve it also does, but the restrictive circumstances, which are dictated by departmental laws, are still strong. Higher educational institutions exist separately, research institutes exist separately, each one exists with its own staff, budget, and leadership. Meanwhile, it is necessary to take the path of establishing unified educational research centers—the path of cooperation. Both science and the training of personnel will gain by this.

If the charter of the Academy of Sciences is revised, which is being talked about more and more often as an urgent necessity, I believe that all these questions should be taken into account.

MOSKOVSKAYA PRAVDA: And what other ones? /

N. N. Moiseyev: Apparently, we should also look with different eyes at the elections to the Academy of Sciences. Election as a member of it is an act of great confidence in one individual or another. The Academy is the most important institution of civilian society, not an administrative establishment. If we look at it from this standpoint, we will see that the system of election to the Academy of Sciences has many shortcomings. In reality we are electing ourselves. But it is very important that the reinforcement of the elite group of scientists would take place on a broader base.

Today in reality a biologist elects a mathematician, an engineer elects a theoretical physicist, and so on. But the election should be conducted by the most competent scientists in one specific field or another, here they might not necessarily be members of the Academy. Only in this case will the choice be made on an equal basis and will the most worthy people receive the title of academician.

Incidentally, it is also possible to formulate other approaches, for models of the formation and reinforcement of elite groups were developed long ago by scientists. By the way, it may also be a question of not only the elections to the Academy of Sciences....

MOSKOVSKAYA PRAVDA: But also as people's deputies, for example?

N. N. Moiseyev: If only that. The mathematical models, which we have today, make it possible to compute any situation. Incidentally, we could have avoided to a significant degree the miscalculations that were made during the recent election, if we had treated with great respect the research, the results of which science has....

MOSKOVSKAYA PRAVDA: Perhaps, I will be asking a naive question. If such research exist, why are we, as they say, beating our brains out?

N. N. Moiseyev: No, the question is not naive. Now I, too, want to know why. Why is no one interested in this research? For it is not lying hidden somewhere, there are works, there are books, they have been published.

But the whole trouble is that when settling the most important questions not the scientific approach, but bureaucratic thinking often predominates. This is the legacy that the administrative command system left us. A legacy, which it is not that simple to get rid of.

What was always most difficult for me? The fact that I spent my whole life with an outstretched hand. But I did not ask to be given anything, on the contrary, I asked that my knowledge be taken, that what had already been done and understood by me and my colleagues be taken. The administrative system does not want to! And works lie on the shelf a long time.... Here is what the main misfortune of our science is.

MOSKOVSKAYA PRAVDA: And do you not see a glimmer?

N. N. Moiseyev: That is, when this does not exist? The process that is occurring today—the disintegration of the administrative command system, the process of the formation of a civilian society—cannot but arouse optimism. And the role of science in the formation of this process should be a more and more guiding one.

MOSKOVSKAYA PRAVDA: In such a case will we all the same end the interview on the holiday on a optimistic note?

N. N. Moiseyev: I believe so. The fact that in the 4 years, which have passed since April 1985, I have observed with pleasure the revival of the spirit of intelligence and its appearance in the young generation of researchers, is also arousing this optimism. I am convinced that, despite the years of repressions and stagnation, the thread, which links the generation of young researchers and those entering science today with the scientists of the 1920's, has not been broken. In many respects owing to such titans as V.I. Vernadskiy, N.V. Timofeyev-Resovskiy....

MOSKOVSKAYA PRAVDA: Nikita Nikolayevich, you remember from Goethe: "And what they call the spirit of the age is the spirit of professors and their discoveries...."

N. N. Moiseyev: Yes, this is very important. For in the next century, from which not that many years separate us, the might of the country will be determined not by the amount of smelted steel and even not by the perfection of computer technology, but by the intellectual potential, which the nation has, and the ability of society to use it. I believe that this is the primary thing, about which we must talk on the Day of Soviet Science.

More Resources for Individuals, Small Groups Urged

18140246 Moscow IZVESTIYA in Russian
3 May 89 p 2

[Article by Academician B. Raushenbakh: "Science Surrounded by Small Flags. The Monopoly on the Truth Is an Obstacle in the Way of Progress"]

[Text] When people curse science, most often this pertains to applied science. But I would like first of all to talk a little about basic science, about experiments that are conducted out of "pure curiosity," and about theory. First, it is well known that nothing can be more practical than a good theory, while, second, all applied science grew and grows out of basic science. An example of this is the explosion of research on superconductivity, which we are observing—precisely now the moment of the switch to applied research and to practice has arrived. But in the beginning there was a theory and the fundamental properties of superconductivity were understood.

Basic research and the plan in our usual understanding are incompatible. It is absurd to plan a revolutionary discovery—if it is possible to foresee it to such an extent, this is most likely a banality.

Now, the theorist is like an 18th century seafarer on the open sea—he searches, at times without knowing himself what—only the greatest skill in plotting a course, intuition, and the ability to analyze facts and information obtained from nature help out; that is how great discoveries were also made both in geography and in physics. Hence, it is also necessary to entrust modern basic research to people of a very high level, whose range of interests, talent, and intuition increase the likelihood of success. While this means that in science it is necessary to finance the individual, and not the armchair. If we speak about assets, it is impossible to imagine that a scientist of the class of Kapitsa or Landau would spend money on equipping his office. As to the choice of a theme, it is difficult to believe that someone could suggest to them a direction of research better than such scientists. And if a breakthrough does occur somewhere in our country, it is not owing to the system of the organization of basic research, but "in spite of" or even despite it. No, if we want to make gains in science at the level of Nobel Prize winners, it is necessary to give the individual freedom of creativity. However, here it is necessary to be certain that this is actually an individual. It is unquestionable that our land is capable of giving birth to its own Newtons, but it is not enough to give birth to them, it is necessary to know how to raise them. Our system, in which just recently the status of a scientist depended utterly and completely on the length of service and the held position, is not conducive to the development of Newtons. There is, for example, a young talented person, if they want to support him, they give him a department. And that is all—Newton died, for he has to bother with certification and with the allocation of people to the voluntary patrol, a sovkhos, and a vegetable base. But this will turn any Newton into either a bureaucrat or a psychopath.

But just how is one all the same to raise Newtons? However strange it is, this formula exists, and it is as only as the world.

Long ago, back when science was not a "productive force," the basic structure of its life—scientific schools—was formed. And this is in spite of the style of scientific work, which dominated at that time—the individual style. Since then the history of science has mainly been the history of schools: the schools of Socrates, Aristotle, Lagrange, Darwin, Pavlov, Rutherford, Vavilov, Ioffe, Kapitsa, and Timofeyev-Resovskiy.

Many Moscow, and not only Moscow, mathematicians remember Luzitaniya—the school of Academician Luzin. If only the fact that academicians: Ivan Petrovskiy, rector of Moscow State University; Mikhail Lavrentyev, founder of the Siberian Academy campus; Andrey Kolmogorov, a most prominent specialist in

probability theory; and world-famous geometrician Pavel Aleksandrov, were members of Luzitaniya, testifies to the level of this school. The listing of the corresponding members and professors, who went through Luzitaniya, would take too long. The schools of Lavrentyev, Kolmogorov, and Petrovskiy are second derivatives of Luzitaniya.

It might seem that earlier everything was better—really the golden age of patriarchal pure science. By no means—side by side with Nikolay Luzin and Nikolay Vavilov there lived Lysenko, and not alone, but with his own.... I cannot bring myself to say school—now they are writing about Lysenko and his people in the most blunt expressions and are even using the word "gang." But most likely this was our first team in science.

Today such "teams" do not essentially conduct criminal activity, by destroying physically or removing from work by amoral methods their scientific opponents. At times these are completely decent collectives of scientists, but the fact that the interests of science are for them in second place is common to all teams. The interests of the team are in first place.

Life itself induces such teams to strive for a monopoly, for there is no other way to stay afloat. The monopolist should take in his hands "everything" so that his "mediocrity" would not be conspicuous. Hence megalomania and enormous scientific research institutes, the associates of which are united only by membership on the team. (At times the large scale is justified by the astronomical cost of experimental units, here it is not a question of such scientific research institutes.) World experience testifies that outstanding discoveries originate in small scientific collectives, which have the right of free creativity, and in the schools of prominent scientists (and not in the teams of prominent administrators).

Scientific teams are a problem of not only basic science. The existence of such teams is supported in every way by departments. They devised a reliable means to lead a quiet life (and at the same time to destroy genuine science), having established "head scientific research institutes" in various directions. From the point of view of the bureaucrat, here everything is wonderful—the head scientific research institute is responsible for maintaining the necessary level of research in the sector. In reality these head scientific research institutes are often worried by the pressure of talented competitors, against the background of whose work the lead role will begin to seem doubtful. Our press is full of examples of this sort. But, I dare say, our lag behind world science is the best proof of the uselessness of these head organizations. Before the war, when teams almost did not exist, but schools did, Soviet science in a number of directions led world science.

If departments want very much to have head scientific research institutes, common sense testifies that it is better to have in each direction two small head scientific research institutes, which work under the conditions of strict competition, than one giant organization which actually checks the development of science.

The team, which is managed by a strong boss, in the struggle against the best school is destined in advance to victory, and young people, often talented ones, begin to seek for themselves precisely a boss—a reliable one, with themes, headquarters, "his own" journal, and so on. As one young biologist noted bitterly: we have decency, but what microscopes they have!

Today it is necessary simply to afford a talented person the opportunity to work, having supported his work and himself materially, regardless of his membership on a team. It is a matter no longer of stars of the first magnitude, but of little stars, which are beginning to flare up, and of candidate Newtons. And it is not necessary to be afraid of the failures of individual researchers. The major breakthroughs in science of the most successful ones will repay with interest the total expenditures.

At one time a large chemical laboratory was organized at the du Pont chemical company, and the extensive opportunity to engage in basic research not according to a plan, but at their own discretion was given to scientists. This cost considerable assets, but nylon was a byproduct of the work of the chemists. It is easy to understand that the expenses were recovered many times over.

It is clear that it is foolish to economize on genuine basic science—the miser pays twice and, moreover, pays with the unavoidability of lagging behind.

The desire alone to do young talented people a great favor is far too little. It is necessary to change the very attitude toward science and to correct the distortions that have appeared in it. The well-known decision on the wage of scientists was adopted immediately after the war. During those years there were very large salaries, which everyone capable of demonstrating that they were scientists began to receive. This had the result that a large number of design bureaus and other similar organizations immediately changed their names to scientific research institutes and increased the salaries of their staff members. The way to becoming "scientists" became for many the way to prosperity and a status in society.

In the past 40 years the wage of workers has increased, they have begun to receive more than scientists (especially young scientists), inasmuch as the wage of scientists has remained the same. And still young people with a higher education feel drawn "to science," and not to production. The point is that the work of engineers at a works and in design organizations is more difficult, but this is in no way offset either by monetary remuneration or by a status in society. As a result energetic and intelligent young people, who wish to make a good

career, as before feel drawn "to science." They are capable of competently conducting scientific research, of writing good quality articles and monographs, and of being genuine professors, and all this is at the average world level. But those, who are above the average world level, people, who often are little suited for modern life, and eccentrics move basic science. It is not difficult to guess that such an eccentric is immediately forced by energetic ambitious people into the background, and science loses a potential Newton. Moreover, he fits poorly into the "team," his very existence is capable of evoking doubts about the scientific level of the boss, he unwittingly violates one of the rules of the team: "Do not stick out."

I see a way out in the sharp increase of the prestige of scientific and engineering labor in industry. The experience of the West shows that this benefits both basic science and industry. In the West a scientist, who has agreed to work for industry, receives much more than he would receive even at the most prestigious university. Those, for whom it is much more important to find out "how the world is constructed" than money, cars, and summer houses are, conduct basic research. If a similar situation were also to be created here, young energetic ambitious people, who are striving to make a good career, would head for industry and for applied science, where their talents could actually be of great benefit.

What has been said should not be understood as a suggestion to reduce the salaries of scientists who are engaged in basic science. These salaries are today intolerably low. It is natural that potential Newtons should be adequately provided for, so that they would devote all their time to science, and would not engage after work in coaching and would not build cow barns during vacation. However, their comrades, who have left for industry and applied science, should receive more. Perhaps, it is even worthwhile to establish for them an "engineering academy," membership in which would be just as prestigious as membership in other academies is, but the path to which would lie not through scientific articles and books, but only through implemented projects. Only the authors of outstanding designs could be members of it. Accordingly, it would also be necessary to institute degrees: doctor-engineer and candidate-engineer with the defense as dissertations of specific implemented original engineering developments.

Individuals, who are capable of basic research, and genuine individualities undoubtedly will remain in basic science and will head its separate, most promising directions, will be at the head of scientific schools, which must also be the main form of the organization of basic science. They can be registered administratively as laboratories. It is best of all if these laboratories would be small and would have complete creative freedom. The auxiliary staff, which is needed for their work, can "watch over" several laboratories simultaneously, it is important merely that it would not have the opportunity to interfere in their scientific activity in essence. And

then, perhaps, such an organization, which is not characteristic of basic science, as giant institutes in their present makeup will disappear. Then it will be possible to hope for the flourishing of genuine science, of which the freedom of scientific research and the joy of knowledge are the basic precepts.

Narrow Specialization Retards Basic Research
18140245a Moscow IZVESTIYA in Russian
7 May 89 p 2

[Article by Doctor of Technical Sciences B. Litvinov, Hero of Socialist Labor and a delegate of the 19th All-Union Party Conference, under the rubric "Problems and Opinions" (Chelyabinsk): "Are We Starting From Waste Ground? The Poor Supply of Basic Science Is Hindering Technical Progress"]

[Text] Many decrees and decisions of different levels on scientific and technical progress have been adopted. And all the same in the resolution of the 19th party conference we read that scientific and technical progress is developing slowly.

Scientific and technical progress (NTP) is an inevitability for a developing state and a burden for a dying one. In our times it is impossible to aspire to a leading role in the world without developing one's own science, technology, and the well-being of the people. It is impossible to count on it that it is possible to acquire all innovations abroad, while it is possible to learn to make new things only at joint ventures. It is also necessary to remember that the future lies not in the product, which is now arriving on the market, but in the one, which is still just being developed in laboratories and design and technological bureaus and is being assimilated in experimental shops.

One of the main causes of the sluggish development of scientific and technical progress in our country, in my opinion, is the fact that for a long time now applied science has been essentially sectorial science, which, as a rule, works on narrow departmental problems. Due to departmental barriers the gains, which have been made in one sector, either are unknown in another or are not being used. Even academic institutes, which first of all are called upon to settle general scientific, basic problems, often are highly specialized.

It is easy to demonstrate that the narrow specialization of a scientific research institute in the end leads to a focus on petty themes and to the loss of perspective. The capitalists understood this long ago. Modern international corporations are developing successfully precisely owing to intensive research in various fields of science and technology. It is also necessary to develop our domestic scientific research institutes and design bureaus, by combining highly specialized organizations into larger, polytechnical ones.

The dictation on the market of the consumer, and not the producer, is a no less important condition of the development of scientific and technical progress. Why does the producer need progress and additional expenses, if all the same people buy its product? Moreover, the innovations, which scientific organizations offer, often also involve very much trouble in the assimilation of their mass production. This is happening due to the fact that many of our scientific research institutes and design bureaus not only are small, but are also not yet up to full strength.

What is meant by this? For the successful development, production, and consumption of new things, it is necessary to complete an entire series of operations: to study supply and demand and to specify the nature of a future item in the language of modern production—drawings, specifications, and everything that is called the design documentation. It is a question of specifying how to make a new item more rapidly, less expensively, and better. And, finally, there follows the production of experimental specimens for tests and the checking of this newest thing for serviceability, reliability, and durability.

Thus, in order to develop new, high-quality items, which are practicable for modern mass production, it is necessary to unite scientists, design engineers, and process engineers in one scientific research institution and to support their work with modern computers and all the necessary testing and research equipment. Scientific research institutes and design bureaus, which have been organized in this way, become in practice independent of the whims and dictation of mass production and the market. There appears for them everything that is necessary and sufficient to keenly sense the market conditions. And in international cooperation they will be able to act as equal partners who arouse respect.

Scientific research institutes, which are engaged in applied work, are often called the motors of scientific

and technical progress. But the discoveries and achievements of basic science serve as fuel for these motors. Therefore, just as they are not sparing forces and assets for the extraction of fuel for power engineering and other sectors of our economy, one must also not spare assets for the development of basic science. It is necessary to increase sharply, by five- to sevenfold, the spending for this purpose. It is necessary to give institutes of the Academy of Sciences (if only them to begin with!) the right to make special orders for materials, reagents, and instruments with a time of their supply of not less than a month.

All Soviet scientists have been dreaming about this for a long time now. But so far their appeals to any instances remain the voice of one crying in the wilderness. Without the organization for scientific institutions of more prompt material and technical supply and construction than for other enterprises it is difficult to speak about the acceleration of scientific and technical progress, for it is impossible to pick up speed from a void and without the necessary materials and instruments.

The establishment and development of powerful polytechnical applied scientific research institutes do not exclude at all the development of academic institutes. Of course, basic research should be their basic pursuit. But often these very pursuits also indicate the means of the practical use of such research.

There is no doubt that the uniting of the efforts of academic and applied institutes on bringing new materials or items up to mass production will be more effective than when this is done only by the efforts of one academic institute. But such unions should be formed on a financial, contractual basis. The relations with mass production should also be formed on this basis. Let the developers of innovations, which are in demand, derive a profit from their marketing (sale). Such deductions for the benefit of scientific research institutes should be significant, but not so much as to make the payments unacceptable for mass production.

Financial Problems of MNTK's Described
18140255 Moscow FINANSY SSSR in Russian
No 4, Apr 89 pp 47-51

[Article by S. V. Onyshko, senior scientific associate of the Institute of Economics of the Ukrainian SSR Academy of Sciences, and A. A. Domanevich, chief of the Production Planning Department of the Institute of Problems of Material Science of the Ukrainian SSR Academy of Sciences: "Financial Problems of Interbranch Scientific Technical Complexes"]

[Excerpts] One of the newest forms of the integration of science with production is interbranch scientific technical complexes (MNTK's). They are called upon to concentrate scientific forces and material and technical resources for the solution of the most important problems in the main directions of scientific and technical progress and to ensure the manifold shortening of the innovation cycle.

At present 23 complexes are operating in the country. They include about 500 organizations and enterprises. Several of them have developed into powerful scientific and technical conglomerates, which are conducting research and development at the world level and are characterized by a high economic efficiency.

At the same time the actual state of affairs at interbranch scientific technical complexes testifies that the large and diverse potential, which the complexes have, to a significant extent remains unused. A substantial portion of the complexes have not become the structural unit of the national economy, which is capable of speeding up fundamentally the process of the development and assimilation in production of highly efficient types of equipment, technology, and materials of a new generation. The incomplete character of the formation of complexes was a consequence of a number of causes. First of all this is the inadequate theoretical and practical development of a number of key economic, organizational, and legal mechanisms of the functioning of complexes at the stage of their formation. The management of the complexes was not furnished with the necessary standard procedural documents on the conducting of current activity. As a result, for the majority of them the organizational period was dragged out. This affected the subsequent development of the complexes, which took place slowly and not very successfully.

The administrative methods of management, being predominant at the stage of the formation of interbranch scientific technical complexes, retained their basic importance. As for the economic methods of management, they proved in practice to be undeveloped. The untenability of such an approach is obvious. The duality of the administrative subordination of the enterprises

and organizations, which are a part of interbranch scientific technical complexes, not only did not weaken the influence of administrative methods, but in many cases turned them into an obstacle of the efficient functioning of the complexes.

A mechanism, which would unite all the participants in interbranch scientific technical complexes on the basis of the principles of mutual economic interest and responsibility and would have an influence on the organizations participating in the work, was not developed. Only the right to the "spiritual" supervision of the member organizations is acknowledged for interbranch scientific technical complexes, which do not have any management levers. They are subordinate organizationally, economically, and administratively to their own ministries. The management of the interbranch scientific technical complex and the head organization in practice lack the rights and organizational and economic levers, which make it possible actually to influence the material and technical supply of assignments, the development of the pilot industrial base, and the formation of the policy of ministries in the area of the directions of scientific and technical progress, which are attached to the complexes. That is why many interbranch scientific technical complexes to this day are primarily formal formations. In the process of their activity it has not been possible to achieve the organizational and economic unity of all the component units.

One of the most important conditions of the increase of the efficiency of the functioning of the interbranch scientific technical complex consists in the thorough restructuring of its financial mechanism. At present this mechanism is poorly linked with the requirements of the new system of management and does not conform to the tasks of the development of interbranch scientific technical complexes. The situation, which has formed in this area, in many respects is paradoxical. The complex is neither the holder nor the real manager of the assets, which have been allocated for the solution of the specific scientific and technical problems that in the final analysis brought interbranch scientific technical complexes into being. Without having the appropriate resources, the interbranch scientific technical complex is unable to interest and to involve in joint work the enterprises and organizations, whose participation is extremely necessary for the fulfillment of the tasks set for it.

Today the unified plan is the basis, on which the interaction of the organizations of the complex is carried out. However, the lack of the necessary scientific substantiation and the domination of administrative methods of management led to a subjective approach during its drafting and approval. Formed by the mechanical combination of assignments from different sources and not having adequate resource supply, this plan objectively could not become an organizing principle in the activity of the complexes and in their interactions with suppliers and consumers. Under the conditions of the formed

status and structure of the complexes the restructuring of the system of the financial support of interbranch scientific technical complexes is simply necessary.

The changeover to full cost accounting and self-financing at the same time as industrial enterprises and associations of scientific research and planning and design organizations as well is creating new conditions for the use of the stimulating potentials of financial levers in the sphere of scientific and technical activity.

The system of the financial support of complexes should contribute to the conducting of scientific research, which is aimed at the search for new ideas and scientific and technical solutions, and to the development of competitive equipment and technology. Moreover, it should provide for the possibility of scientific risk and promote the establishment of such an order, when the interbranch scientific technical complex bears economic liability for the results of its activity, including full compensation for the caused economic harm which occurred as a result of the poor quality performance of work.

Practical experience testifies that in recent years the improvement of the established forms and methods of the organization of their activity, including financial activity, was characteristic of all the functioning interbranch scientific technical complexes. However, after eliminating or moderating individual discrepancies, the subsequent correcting decisions as a whole did not yield an appreciable increase of the efficiency of the activity of these formations. And not only due to the lack of an integrated approach to the solution of worthwhile problems. Perhaps the primary thing—the elaboration of a concept of the interbranch scientific technical complex as an economic organizational form of the integration of science and production—proved to be overlooked. The improvement of the mechanism of the management of the interbranch scientific technical complex should be a coordinated set of steps and levers, which are connected, on the one hand, with the enhancement of a number of provisions on the formation of the concept of the interbranch scientific technical complex and, on the other, with the regulation of the economic mechanism of activity for the transformation of complexes into an integral and manageable organism.

As for the concept of the development of the interbranch scientific technical complex, it is necessary to note the following. The interbranch scientific technical complex as a formation, which is oriented toward the solution of a specific scientific and technical problem, at its basis should be, first, a temporary structure. The actual term of the functioning of a complex is governed by the necessity and state of the solution of the problem that brought about its appearance. Second, these structural formations should be very flexible and mobile. For the solution of problems that have arisen the interbranch scientific technical complex must create temporary collectives, engineering centers, and so on.

Under unified administrative and methods supervision the organizational structure of the interbranch scientific technical complex should unite a set of scientific research, design, and technological organizations and enterprises, which are capable of ensuring the continuity of the cycle from the scientific idea to wide-scale introduction. The complex should be given the status of independence. It should act as an independent organ, which has the rights of a juridical person and has an independent balance sheet, a separable management apparatus, and accounts at banks. [passage omitted]

The strictly established structure of the interbranch scientific technical complex does not exclude the participation in its developments of enterprises and organizations that are subordinate to other departments. Such participation presumes the preliminary selection of developers on a competitive basis with the subsequent enlistment of the winners of the competition in developments of the interbranch scientific technical complex on a contractual basis.

Under the conditions of the proposed structure the interbranch scientific technical complex is capable of ensuring not only the accomplishment of the priority tasks of practice at the level of the "science-technology-production" system, but also the assimilation and practical implementation of new principles and methods of management, which are based on cost accounting and self-financing. The vital activity of such a complex should provide a precisely developed economic mechanism of the management of the interactions of the partners.

The economic relations of the interbranch scientific technical complex with the organizations, which are participating in it and are a part of it, are formed strictly on a contractual basis. The complex is obliged to have the right to conclude independently contracts for the fulfillment of jobs. The introduction of such a status will provide the interbranch scientific technical complex with a direct outlet to central directive organs (the USSR Council of Ministers, the USSR State Planning Committee, the State Committee for Science and Technology, and others) for the prompt accomplishment of tasks. All the plans of the interbranch scientific technical complex should be implemented through a system of economic contracts and state orders. The complex should be a fund holder and a manager of resources and have the right to change the terms of the financing and stimulation of research and technical development, which are connected with the fulfillment of state orders and economic contracts.

Acting in such a capacity, the interbranch scientific technical complex will be able to carry out the efficient monitoring of the fulfillment of jobs, to make an evaluation of developments, to ensure the strictly specific spending of financing assets, including currency assets,

and actually to settle questions of material and technical supply and the provision of production capacities for the production of prototypes of equipment and instruments through the state order.

The thorough and qualitative restructuring of the forms, methods, and sources of financing should be incorporated in the mechanism of the financial support of the interbranch scientific technical complex. At present a multiplicity of sources of financing characterizes the system of financing of the interbranch scientific technical complex. Among them are assets of the state budget, which are allocated in a centralized manner within the state order for the development of a new product and in part for the organization and output of test runs and for the conducting of basic operations; assets of enterprises and organizations, which are received within the frame of concluded contracts; payments from the assets of ministries, departments, enterprises, and organizations, which are interested in the rapid performance of the corresponding work; the standard deductions in case of the sale of the scientific and technical product and services, as well as from the profit of enterprises that make products in accordance with developments of the interbranch scientific technical complex; bank credits. It is also possible to describe the system of financing of the interbranch scientific technical complex as a system of mutually complementary sources. Its formation to a certain extent reflects the specific peculiarities of the interbranch scientific technical complex as a form, which was brought into being by the many-sided process of the integration of science and production. The system of mutually complementary sources of financing has a particular effect on the realization of the processes of the socialization of physical and spiritual production. This is dictated, first, by the increased possibilities in the shifting of resources for the prompt solution of arising problems. Second, the existence of such a system of financial support to a significant degree guarantees its necessary stability by means of the possible choice of sources.

In reality owing to the dual subordination of the enterprises and organizations, which are a part of the interbranch scientific technical complex, and the lack of the legal regulation of the financial interrelations between the interbranch scientific technical complex and the corresponding ministries the assets with respect to the state order, which are allocated in a centralized manner, are the basic source of financing of the interbranch scientific technical complex.

Under the conditions of the restructuring of the financial mechanism the formed structure of the sources of financing should inevitably undergo quantitative and qualitative changes. In the future (given the expansion of the activity of interbranch scientific technical complexes, the strengthening of the contact with production and the changeover to contract prices, the sale of the product) the importance of such sources as the interbranch scientific technical complexes' own profit and the payments from

ministries, departments, and organizations, which are interested in the development of complexes, should increase substantially. [passage omitted]

The deductions from the profit of organizations, which make a product in accordance with developments of the interbranch scientific technical complex, as well as from the profit, which is derived in case of the duplication of this product, should become the basic source of the formation of the interbranch scientific technical complex's own revenues. The profit, which has been derived from all types of its activity—economic, commercial, and others—should be an important source of the revenues of the interbranch scientific technical complex.

The creation and legislative consolidation of internal sources of financing serve as a material guarantee of the settlement of the vital questions that determine the goal of the establishment of the interbranch scientific technical complex. In the future the importance of the indicated sources, in our opinion, will increase as much as possible.

For the present it must be stated that in practice owing to reasons of an objective and subjective nature two centralized funds: the bonus fund for the development, assimilation, and introduction of new equipment and the currency fund, have been created in accordance with the Model Statute on the Interbranch Scientific Technical Complex only at several interbranch scientific technical complexes. These funds are among the most important economic levers which ensure the necessary efficiency of the functioning of the interbranch scientific technical complex. By means of them the possibilities of the centralized influence of the interbranch scientific technical complex on the economic activity of its units increase. Otherwise the activity of the interbranch scientific technical complex, which is not supported by the corresponding economic levers, can come into conflict with the economic interests of the enterprises and organizations, which are a part of it and are participating in its work.

The centralized funds should turn into one of the basic sources of financing of the complexes. The outlays, which are connected with the expansion of research and development, the improvement of production, retooling, and the modernization of operating facilities and the construction of new ones, which are necessary for the fulfillment of the assignments of the interbranch scientific technical complex on the development and assimilation of new equipment, to a significant extent should be reimbursed from the centralized funds. Along with these funds, which are envisaged by the prevailing enforceable enactments, it is necessary to create an additional one—the fund of the scientific, technical, and social development of the interbranch scientific technical complex. In our opinion, the indicated fund can also be a source of the financing of the current activity of the interbranch scientific technical complex. The formation

for these purposes of an independent fund seems economically advisable. The size of the funds should be directly linked with the results of the cost accounting activity of the complex as a whole and its structural units, in particular.

The specific nature of the activity of each of the complexes and the mechanism of their interaction with partners are of decisive importance when identifying the real sources of the formation of centralized funds. In most generalized form the following sources are possible:

- assets of the state budget, which are allocated under the conditions of the special-purpose financing of the state order;
- the assets of ministries, departments, and organizations, which are received either within the framework of the fulfillment of concluded economic contracts or by way of sharing in case of their direct interest in the development of some projects or others;
- the interbranch scientific technical complex's own profit;
- the currency receipts from the sale of products and the carrying out of other operations of the complex abroad.

The choice of specific methods of the practical achievement of the set goal is a no less important question when solving the problem of forming the centralized funds of interbranch scientific technical complexes. They can be:

- the change of the settlement interrelations of enterprises and organizations with the state budget or with the ministry in favor of interbranch scientific technical complexes;
- standardized deductions of a portion of the profit of interbranch scientific technical complexes and the profit, which has been derived from the sale of a product that is made in accordance with the developments of complexes.

Under the new conditions of management the method of standardized deductions from the profit of the interbranch scientific technical complex is economically advisable. At the same time it is necessary to take into account that the formation of centralized funds is difficult without their creation in some initial amounts by means of special-purpose allocations. A portion of the deductions, which have been channeled into the corresponding funds of ministries by the enterprises and organizations of the complex, as well as the contributions of the enterprises proper of the interbranch scientific technical complex can be the basis of the initial creation of the funds of the interbranch scientific technical complex. Here the procedure of deducting a portion of the funds of interested ministries for the complex should be stipulated by decisions of directive organs.

The plans of work of the interbranch scientific technical complex and separate decisions of its council should be the basis of the distribution and use of the centralized funds.

The aspects touched upon, of course, do not exhaust the entire group of difficult financial problems of the development of interbranch scientific technical complexes. The specific nature of the conditions of the activity of complexes requires a very cautious approach to the formulation of statutes and recommendations of a general nature. However, the one thing that is unquestionable is that the improvement of the financial mechanism of interbranch scientific technical complexes at present is a most important component of their successful functioning.

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Disadvantages of Self-Accountability Weighed
18140243 Moscow SOTSIALISTICHESKAYA
INDUSTRIYA in Russian 4 May 89 p 2

[Article by Candidate of Technical Sciences D. Aleynov, head of the laboratory of the forecasting of scientific and technical progress of the State Scientific Research and Design Institute of the Nitrogen Industry and Products of Organic Synthesis, under the rubric "The Science of Moving Science" (Moscow): "The Scientific Research Institute Will Become a Cooperative"; first two paragraphs are SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] The advocates of cost accounting in science do not get tired of stressing such merits of it as a more flexible system of the remuneration of the labor of scientists and economic independence. Without denying the importance of both, I will still venture to doubt the vital importance of these things for the acceleration of scientific and technical progress in the country.

While at the largest chemical companies of the world, which conduct their own research—Hochst, Occidental Petroleum, and others—I had the opportunity to be convinced that the forms of the remuneration of the labor of scientists and researchers, which are used there, from our "cost accounting" point of view are primitive. These companies strive to guarantee their employees a stable high income, which is not linked with the specific monthly successes or failures of the worker, and especially with the number and value of the orders, in the filling of which the worker was involved. Such a faulty, in our opinion, "stagnant" practice for some reason is not leading to the bankruptcy of these firms or to a lag in their field. It is clear that other stimuli, among which, incidentally, unemployment is not: highly skilled chemical specialists in America and Europe are very costly, are at work.

"Economic independence" in the western understanding also differs from our interpretation. The firms there, of course, are total independent legally and economically. However, they willingly give up a substantial share of their independence in exchange for participation in long-term projects and programs, which are financed by the government, at times fulfilling immediate directives of government officials, or, as we would say, the bureaucratic administrative system. Whereas our institutes at times are reminiscent of boys, who have read Mayne Reid and dream of running away "to the prairies," western firms, on the contrary, value highly their closeness to the machinery of state and do not intend at all to exchange it for unlimited market "freedom." Although it is child's play for them to do this.

In short, the key to overcoming our lag, in my opinion, lies not in changes in the two noted areas of the organization of science. In the organization of the output of scientific and technical products here and abroad there is one more important circumstance, to which for the present they are hardly directing attention.

Our sectorial scientific research institutes always based their plans primarily on the orders of ministries and departments. Cost accounting only aggravated the situation. In all the basic documents, which regulate it, "client" is the key word, while the contract for the development of a scientific and technical product is becoming the leading form of the interrelationship of the parties. But the cost accounting form is good when it is a question of improving a known item or technology. It is impossible to conclude a contract for the discovery or development of something truly new, because a truly new thing is that, which no one suspects and which it is impossible to formulate, without being an inventor or scientist.

Western firms operate differently. In the majority of cases they offer potential clients accrued operating times, which were completed in an enterprising manner at the risk of the firm. If this product does not interest anyone, the firm incurs losses. Hence the aspiration to give it all one has and to shorten the time as far as possible, in order to lead competitors.

One would like to know: What is preventing our scientific research institutes from organizing work after this pattern? We will not now touch upon the lack of interest of departments and enterprises in technical progress; this is the theme of a special discussion, and there are hopes that the situation here will change for the better. Let us turn to the problems of science itself.

Institutes do not have sufficient working capital for the development of their own research work. For example, according to rough estimates, our institute needs 70-100

million rubles for research in the area of new technologies. But the entire annual profit is 8 million rubles, half of which is deducted for the development fund. It is easy to calculate how many years we will need to accumulate the required amount.

It would seem that contract prices, which were introduced by cost accounting, make it possible to increase substantially the revenue of the institute. However, contract prices are hardly being used both here and at the absolute majority of other scientific research institutes. The price for a scientific and technical product is calculated not on the basis of the utility or effectiveness of a development, but in the old way—the costs plus the sectorial profitability of about 20 percent. It is easiest of all, of course, to plead the timidity and incompetence of executives of scientific research institutes. But there is also another explanation.

Even after changing over to cost accounting, the institutes as before remain departmental organizations. The dependence on ministries remains, although, perhaps, it is altered somewhat (which confuses some people). And precisely the ministries usually "pressure" subordinate scientific research institutes, forcing them "in the name of the interests of the sector" to agree to the former method of calculating the price for a scientific product.

This pressure has a powerful legal basis. For the scientific and technical product of institutes, strictly speaking, does not belong to them. The question of the ownership of scientific and technical developments (which are not protected by patents or inventor's certificates; there is not even any clarity there) in all the documents, which are devoted to cost accounting in science, is passed over in science. The majority of lawyers, however, are inclined to the opinion that inasmuch as the fixed and working capital of the scientific organization belongs to the state and inasmuch as the state financed the training of specialists and in the end it once again paid for their work, the fruits of the activity of the scientific research institute in all fairness also belong to the state—in the person of the department, which gives orders to the given institute or financed the development. A strange situation also arises: the "base" decrees on cost accounting in science enable the scientific research institute to trade its scientific product, but in reality the two most important rights of the merchant on the market—to establish the price and to duplicate its commodity—are infringed on.

The right of the free, unrestricted duplication of a scientific product naturally follows from the right of ownership of this product. Throughout the world the developer will trade the base design of a plant or a new technology as long as there remains a demand for them (if, of course, the first buyer did not agree to pay for his own monopoly right to this product). In our country one has only to transfer to an enterprise or ministry the same

technological line, and it instantly also usurps the settlement of the question of duplication. The State Committee for Science and Technology, which established in February that the revenues from the duplication of a scientific and technical product do not increase the wage fund of the scientific research institute, has also made its contribution. New strict documents are also being prepared. It is difficult to expect clearer evidence of the alienation of the scientific and technical product from its developers.

Meanwhile, any cost accounting in science will be only a figures game, if the right of ownership of the scientific and technical product is not attached to its developers. Only in this case will the organization and labor collective be able to derive the maximum benefit from good work. Consequently, only in this case will there appear for them a stimulus to take risks and to undertake a little known theme. So far, given the present dependent status of institutes, "a journey into the unknown" seems less attractive than quiet picking at a "safe" theme.

However, if the institute as before operates on everything belonging to someone else—from raw materials to premises—all discussions about the ownership of the final scientific and technical product will remain speculation. Only a part, which was made from my raw materials on my equipment, can be considered "mine." Consequently, the question of the ownership of the fixed capital of the scientific organization also arises. The lease is not the optimum solution, although it is certainly better than both models of cost accounting. A short-term lease does not stimulate the lessee to invest assets in the

development of the organization. A long-term lease is economically burdensome, since the lessee pays over long years an amount that exceeds by many fold the value of the fixed capital. It is difficult to expect the substantial improvement of the picture from such a lease in science.

The conversion of a significant number of sectorial institutes into cooperatives would, apparently, be an exhaustive solution of the problem. Inasmuch as hardly any labor collective has enough assets to "buy back" at one time the fixed capital and everything required in addition to that from the state, it is necessary to carry out the transfer of this fixed capital on the condition of installment payments—with or without interest, depending on the situation. Of course, "the formation of a cooperative" is necessary and possible only where the conditions exist for this: first of all where there are an established commercial mechanism and a large number of consumers—in short, the prerequisites for market relations. At first one should, apparently, refrain from conversions into cooperatives of those scientific research institutes, at which research work with prospects, which for the present are unclear, is being performed: the temptation to curtail it and to deal with "a bird in the hand" may prove to be too strong under the conditions of a catastrophically unmet demand for it.

It is impossible, of course, to carry out this process in 1 hour. The main difficulty is that the departments, to which the institutes belong, are not interested in the indicated conversions. At the same time many institutes are also not interested, inasmuch as this signifies the end of a quiet life. However, I do not see another way.

Engineering Centers at Paton Electrowelding Institute Described

18140227 Moscow SOTSIALISTICHESKAYA
INDUSTRIYA in Russian 23 Apr 89 p 1

[Article by G. Nikolayev, academician: "Model for Tomorrow." Passage in boldface as published]

[Text] Even the first president of the UkSSR Academy of Sciences, Academician V.I. Vernadskiy, saw the commonality of the interests of science and practice in serving the people. The aspiration of combining the distant search with the solution of urgent tasks became the main tradition of Ukrainian scientists. When the administrative command system fell on the basic sciences, the Ukrainian SSR Academy of Sciences was the only one of the republic academies to far-sightedly maintain technical-type institutes in its structure, many of which comprise its glory today. These include the Electrowelding Institute imeni Ye.O. Paton. However, our present story is not about the achievements of its workers, but about how, year by year, an optimum model for a scientific and technical production line was created and began to operate

Foreign experience attests: small companies, prepared to take risks, are one of the most efficient forms for mastering new ideas. The Electrowelding Institute also started as a small laboratory. There was also a bold idea—replacing rivets, with which metal structures were assembled, with a welded seam.

At first, it was necessary to prove that this seam was capable of being sufficiently sound. In order to do this research, Yevgeniy Oskarovich Paton, already well-known at that time, in the 1930s, as a specialist in building bridges and metal structures, organized a small laboratory. After the problems of soundness had been solved in an initial approximation, the scientists undertook the development of a welding technology and the corresponding equipment.

The new task required new organizational forms. On the basis of the laboratory, the Electrowelding Institute appeared. At first, it was similar to most academic institutes. However, Ye. Paton then advanced the idea of replacing manual welding processes with mechanized and automated ones, and developed a method for welding under a layer of flux, which played a very great role in the production of tanks during the Great Patriotic War. It also became clear that it was impossible to create promising technologies without an experimental base, without an experimental production facility.

Having headed the UkSSR Academy of Sciences Electrowelding Institute in 1953, Academician Boris Yevgenyevich Paton, son of the institute's founder, fascinated the collective with his purposeful attitude toward the fundamental solution of practical problems. One after another, developments such as arcless welding, welding in a carbon dioxide gas environment, the contact welding method, and diffusion welding, came out. In this

regard, the academic institute not only supplies industry with new technologies, but also with the progressive equipment for them. For example: the systems for the automatic welding of large-diameter gas pipelines, which have become established everywhere.

The institute's experience confirms that the most revolutionary changes in equipment, technologies, and economics spring up on the basis of basic research.

"The acute need to create a standard organizational and economic mechanism for accelerating scientific and technical progress, the elements of which should be the purposeful and practical support of priority work, strict cost-accounting relations among the parties, the optimum combination of leaders' rights and responsibilities, and all workers' level of interest in achieving the highest technical and economic indicators, has become imminent," B. Paton indicated at the 27th CPSU Congress. His institute has already started putting this idea into practice.

An important step along this path was the formation of creative collectives consisting of scientists and production workers, joined by a large scientific and technical problem. In such a union, all stages—the development of ideas, research, design development, and invention activity—are carried out jointly. Essentially, the institute is gradually turning into a large scientific and technical complex (NTK).

The engineering centers (ITs), created in Kiev, also became a requisite element of this complex. Each is a goal-oriented creative collective, including design and technological NTK subdivisions, and working in direct contact with the corresponding research (scientific) department of the institute. The engineering center strengthened part of the capacities for experimental production or the experimental plant of the NTK. The scientific leader of the engineering center—the chief of the institute's scientific department—determines the exploration strategy.

The specialists of the engineering centers, through their own efforts or cooperating for brief periods of time, organize the production of a few models and a test series of the new equipment. They determine the rational spheres and scales for the application of scientific developments, perform additional work for purposes of its maximum approximation to the conditions of specific industries, prepare the necessary technical documentation, perform start-up adjustment work, consult with production workers, and conduct the training and retraining of specialists.

It would seem, the engineering center is the optimum model for scientific organization, which has achieved the complete unity of the interests of science and industry and had worked out an improved mechanism for bringing the latest achievements of science and technology into the national economy, which ensures the large-scale

introduction of the results of scientific research. However, alas, departmental barriers, which even the engineering center lacks the strength to overcome, interfere with application.

Hence, the next logical step was the idea of interbranch scientific and technical complexes (MNTK). One of the first MNTK was created on the basis of the NTK of the Electrowelding Institute imeni Ye.O. Paton. The institutes and enterprises of USSR Minelektrotekhprom, Minstankoprom, Minkhimmash, and Minpribor participate in its work. Existing engineering centers were also successfully enlisted in the MNTK. Having taking all work to introduce innovations upon itself, it enables scientists to concentrate efforts on the further development of basic research and on creating a new scientific surplus.

"Laboratory—academic institute—NTK with engineering centers—MNTK..." Each step the collective takes on this path is marked by a new convergence of science with industry, by new models of highly efficient hardware and technology.

Paton Electrowelding Institute Praised as Model Research Organization

18140245b Moscow SOTSIALISTICHESKAYA
INDUSTRIYA in Russian 23 Apr 89 p 1

[Article by Academician G. Nikolayev: "A Model for Tomorrow"; first paragraph is SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] It was Academician V.I. Vernadskiy, the first president of the Ukrainian SSR Academy of Sciences, who saw the community of the interests of science and practice in serving the nation and people. The aspiration to combine long-range research with the accomplishment of vital tasks became the main tradition of Ukrainian scientists. When the administrative command system fell upon the basic sciences, the Ukrainian SSR Academy of Sciences was the only one of the republic academies to preserve in a far-sighted manner within it institutes of the technical type, many of which constitute today its fame. Among them is the Institute of Electric Welding imeni Ye.O. Paton. But in our present account it will be a matter not of the achievements of the workers of the Institute of Electric Welding imeni Ye.O. Paton, but of how year after year an optimum model of the scientific and technical conveyor was developed and began to operate.

Foreign experience testifies: one of the most effective forms of the assimilation of new ideas is small firms that are willing to take risks. The Institute of Electric Welding also began with a small laboratory. There was also a bold idea—to replace rivets, by means of which metal components were joined, with a welded seam.

First it was necessary to prove that this seam is capable of being sufficiently strong. For conducting such research Yevgeniy Oskarovich Paton, who already then, in the 1930's, was well known as a specialist in the area of bridge building and metal components, also organized a small laboratory. While after the questions of strength were settled on first approximation, scientists undertook the development a welding technology and the corresponding equipment.

The new task required new organizational forms. And on the basis of the laboratory the Institute of Electric Welding emerged. Initially it was similar to the majority of academic institutes. But then Ye. Paton advanced the idea of replacing manual welding processes with mechanized and automated ones, the method of submerged arc welding, which played such a large role in the production of tanks during the years of the Great Patriotic War, was developed. And it became clear that without an experimental base and without a pilot works it is impossible to develop promising technologies.

After taking charge of the Institute of Electric Welding of the Ukrainian SSR Academy of Sciences in 1953, Academician Boris Yevgenyevich Paton, son of the founder of the institute, fascinated the collective with his orientation toward the fundamental solution of problems of practice. Such developments as arcless welding, carbon dioxide shielded arc welding, resistance welding, and diffusion welding appeared one after the other. Here the academic institute is supplying production not simply with new technologies, but also with advanced equipment for them. An example of this is the universally recognized units for the automatic welding of large-diameter gas pipelines.

The experience of the institute confirms: the most revolutionary changes in equipment, technology, and the economy occur on the basis of basic research.

"An urgent need has arisen for the establishment of a unified economic organizational mechanism of the acceleration of scientific and technical progress, of which the special-purpose and prompt supply of priority operations, strict cost accounting relations of the parties, the optimum combination of the rights and responsibility of managers, and the interest of all personnel in the achievement of the highest technical and economic indicators should become elements," B. Paton reported at the 27th CPSU Congress. His institute has already begun to put this idea into practice.

The establishment of creative collectives made up of scientists and production workers, which are united by an important scientific and technical problem, was an important step in this direction. In such a union all the stages—the analysis of ideas, research, planning and design development, inventive activity—are carried out together. While the institute gradually develops, in essence, into a large scientific technical complex (NTK).

The engineering centers (ITs's), which originated in Kiev, also became a necessary element of such a complex. Each of them is a special-purpose creative collective, in which the design and technological subdivisions of the scientific technical complex, which work in direct contact with the corresponding research (scientific) department of the institute, are included. A portion of the capacities of the pilot works or pilot plant of the scientific technical complex is attached to the engineering center. The scientific supervisor of the engineering center, who is the head of a department of the institute, specifies the research strategy.

The specialists of the engineering centers on their own or in cooperation organize in the shortest possible time the output of single specimens and pilot runs of new equipment. They specify the efficient spheres and scale of use of scientific developments, perform additional work for the purpose of their maximum approximation of the conditions of specific works, prepare the necessary technical specifications, carry out start-up and adjustment operations, advise production personnel, and carry out the training and advanced training of specialists.

It would seem that the engineering center is the optimum model of the scientific organization, in which the complete unity of the interests of science and production has been achieved and an advanced mechanism of the transfer of the latest achievements of science and technology to the national economy, which ensures the wide-scale introduction of the results of scientific research, has been developed. But, alas, departmental fences, which even the engineering center is incapable of overcoming, are hindering introduction.

Hence the idea of interbranch scientific technical complexes (MNTK's) was the next logical step. One of the first interbranch scientific technical complexes was established on the basis of the Institut elektrosvarki imeni Ye.O. Patona Scientific Technical Complex. Institutes and enterprises of the USSR Ministry of the Electrical Equipment Industry, the USSR Ministry of the Machine Tool and Tool Building Industry, the USSR Ministry of Chemical and Petroleum Machine Building, and the USSR Ministry of Instrument Making, Automation Equipment, and Control Systems are taking part in its work. The existing engineering centers also successfully joined the interbranch scientific technical complex. Having assumed all the work on the introduction of innovations, they are enabling scientists to concentrate efforts on the further development of basis research and on the creation of a new scientific reserve.

"The laboratory—the academic institute—the scientific technical complex with engineering centers—the interbranch scientific technical complex".... Each step of the collective along this path has been marked by the new convergence of science with production and by new models of highly efficient equipment and technology.

New Academy To Study Social, Ecological Issues
18140266 Moscow MOSCOW NEWS in English
No 21, 28 May-4 Jun 89 p 2

[Article by Valentin Dubin: "Public Academy"]

[Text] The first steps have been taken towards the creation of a new public Academy to study urgent issues of social and economic progress. An organizational committee has been set up by the participants in a recently held conference of public organizations in Moscow.

The public Academy's main function will be to study the scientific potential of the Russian Federation which can be employed to hasten the social and economic progress being brought about by perestroika. Recommendations will be made concerning a more rational use of natural resources, ecological issues and the improvement of Soviet way of life, the development of culture and moral education. It is hoped that the Academy will quicken the introduction of advanced scientific discoveries and inventions. Scientific theories, as well as legislative acts, will be studied in order to see whether they could be harmful for nature or society.

The organizational committee consisting of scientists, scholars, writers, and public figures has been given the task of drawing up the Academy's Rules and arranging a constituent conference. Pyotr Ivankov, Candidate of Science (Military) and assistant professor, has been elected the committee's chairman.

New Cooperative Produces High-Tech Materials, Equipment
18140233 Moscow TEKHNIKA I NAUKA in Russian
No 12, Dec 88 pp 14-15

[Article by G.V. Shevchenko, special correspondent: "We Present an Engineering Cooperative: 'Poisk' on Search"]

[Text] Marat Khamzinovich Sabirov, chairman of the cooperative with this promising name, graduated from the Moscow Institute for Agricultural Industry Engineers. He has worked in a scientific research institute and a scientific production association. He defended his candidate dissertation. He is 41 years old. He had a great deal of industrial experience. However, he was not satisfied with the system for organizing engineers' labor, either in the institute, or in the association. It obstructed creative self-expression. In M.Kh. Sabirov's opinion, the departure from that which was planned was no more than 20-30 percent. Which, by the way, is not surprising. After all, up to one-half of working time is spent in discussions and meetings. Therefore, when the opportunity to create a scientific and technical cooperative arose, Marat Khamzinovich responded.

In the course of 9 months, he broke through bureaucratic barriers. The desired offspring—the "Poisk" [Search] Cooperative—finally came into the light only in April 1987. Right now, M.Kh. Sabirov recalls that period with a smile. He assures us that he did not experience particular difficulties. But then...

In July 1987, the cooperative already started to put out products. The production volume in "Poisk" is growing constantly. Its gross income in the first half of the current year was 751,400 rubles, and the net—654,000. The cooperative leases 10,000 square meters of industrial space in various regions of Moscow. "Poisk" has branches and departments in Ufa, Kyubyshev, Kiev, Ryazan, and Sukhum. The cooperative buys raw materials both wholesale and retail. Moscow enterprises supply metal scrap, graphite and plastic. Enterprises, scientific research institutes, design bureaus, VUZs [higher educational institution], and USSR Academy of Sciences institutes are the basic consumers of the cooperative's products. "Poisk" receives orders from all ends of the country.

There are 80 people on the cooperative's staff—4 doctors of sciences, 12 candidates, and the rest, with few exceptions, are engineers. About 200 people cooperate according to temporary contracts. The salary for permanent associates averages about 445 rubles per month, and for temporary—363 rubles.

"Poisk's" technological subdivisions are engaged in manufacturing the most promising types of products. Super-conducting items and materials, laser equipment, graphite and graphitoplastic, robot equipment, blood analyzers for AIDS—this is far from a complete list of the items, mastered by the cooperative.

Since many models of the products offered by "Poisk" are unique, the buyers usually do not raise the question of price, although the cost of the items is entirely comparable to the cost of similar foreign items, for which they must pay with hard currency. However, the cooperative often offers goods which one cannot purchase abroad. For example, a machine for stretching tennis nets. It costs 500 rubles. A vessel for the atom-adsorption analysis of the structure of the substance being studied—compact, convenient and unique. It costs 50 rubles. One gram of high-temperature super-conducting ceramic, used for microelectronics, is sold for 20 rubles. Only in "Poisk" can you purchase a spatial conveyer line for transporting newspapers. However, the laser technological complex is the pride of the cooperative. It was recently demonstrated at the International Exhibition at Krasnaya Presna and drew the attention of foreign specialists.

The department of laser equipment and technology in "Poisk" is one of their leading departments. This is only some of the work that its specialists are doing: laser cutting of polymers, ceramics and composite materials, hardening parts for friction assemblies and for cutting

tools, developing design documentation for technological equipment, manufacturing technological modules on the basis of series-produced lasers with a total radiation capacity of 100 to 800 Wt...

The department's leader, Anatoliy Vasilyevich Spivak, graduated from Moscow University in 1962 and is a candidate of physical and mathematical sciences. For a long time, he worked at a scientific research institute. However, things were difficult for Anatoliy Vasilyevich there. They tried to "get in" on the inventor's developments. And when he defended his authors' rights, sanctions quickly followed—dismissal from work, transfer to a different subject, and deprivation of the right to use unique equipment. Hence the conflicts. Only after 2 decades did A.V. Spivak acquire creative freedom, at "Poisk." Anatoliy Vasilyevich has 7 author's certificates and 5 invention claims. The scientist considers last year, his year of work at the cooperative, his most effective.

"Poisk" is on a constant search. You will find it a reliable partner. The cooperative's address is: 107082, Moscow, Spartakovskaya Square, Building 16. Telephone: 901-39-63.

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Changes in S&T Cadre Policy Recommended
18140228 Moscow NTR: PROBLEMY I RESHENIYA
in Russian No 7 (94), 1989 p 6

[Article by O. Osipenko, candidate of economic sciences:
"What Do the Cadres Decide? An Economist's Notes on
Competitions and Electivity"]

[Text] Cadre policy in NTP [scientific and technical progress], which has not lost its former greatness, is, as before, based on three major elements.

The first of these is an economic concept: hierarchism, at least our home-grown version. Of the five principles for distributing material wealth known to socialism in the USSR—equal, by labor, by cost (i.e., depending on the correlation of supply and demand in the market), by accumulations (stock dividends, percentages according to investments, sub-leasing, renting apartments, and so forth), and rank (status)—the latter is the most odious violation of social justice. Yet, precisely this method of obtaining means of existence is typical of cadre policy in the NTP sphere. True, here, as opposed to the classic departmental-administrative system, it is sweetened by the fact that salary scales are established not simply by an armchair and the number of telephones on one's desk, but for past services which, perhaps, even occurred once. In the political and economic sense, this is only a pseudo-labor income.

The second major element of cadre policy in the NTP sphere is secrecy in solving key problems, above all, in the certification of scientific and engineering and technical employees for a new post or salary scale, within the limits of the "fork."

In this case, secrecy is the more dangerous, since it passes itself off as collectivity. According to Article 8 of the Law on the State Enterprise, the specialist's fate is in the hands of the certification committee. An entirely democratic procedure, it would seem. However, here is the problem: the director makes the definitive decision to promote or demote an employee in terms of job title and skill category, to raise or lower the official salary scale, and even to release someone from a post. Understandably, his opinion may differ from the committee's position.

The third element is the autocratic nature of cadre policy. It is not enough that decisions on cadre transfers in economic areas which relate to implementing scientific and technical progress are made within the silence of offices, they are also "closed" to the opinion of the line leader (of the sector, laboratory, department, enterprise, institute, etc.). We have become deeply accustomed to the fact that the director hires us for work. He also issues reprimands and announces gratitude: it rarely occurs to us that this procedure is absurd. Labor legislation not only demonstrates these administrative oddities, but also cultivates them.

However, the official fetishism and conformity of the executives are still not the most terrible consequences of the three major elements, which have firmly entered our ideology and cadre policy legislation in the realm of scientific and technical progress. Unfortunately, we are forced to acknowledge that the system for taking talented scientists and engineers away from the official sphere of scientific research and development work is operating entirely successfully today. The outflow of highly skilled specialists into scientific and technical cooperatives and individual invention work is no accident. The millions of unused talents are a national tragedy, the consequences of which we are unable to assess even now.

The principle, unadvertised, but obvious to the unaided eye, of administrative and ideological support for existing "rank tables" in the field of NTP states: ignorance begets ignorance. Ignorance is harmless, for which reason it is convenient for higher-ups. However, it is extremely dangerous for the other associates. To this day, the fates of those who suffer because of an idea prove this.

The eternal question of "what to do?" cannot be avoided here. To be more specific: do we really need costly measures to save the elements of such a cadre mechanism?

Shattering the might of the first element and the currently existing cadre policy means decisively replacing the status principle of distribution in scientific research and development work with principles more appropriate to the nature of socialism: labor and cost principles. Conversion to cost-accounting and to the competitive system for ordering research and development work, and the measures stipulated by the 15 October 1988 USSR Council of Ministers resolution are, unquestionably, a step forward. However, for the time being, in my opinion, it is only the first, timid step. Is it really possible to achieve that which is desired only through the directive Point 2 of this document, addressed to the USSR Academy of Sciences and USSR Gosobrazovaniye ("to create the necessary conditions for developing the democratization of scientific life, overcoming administrativeness and monopoly in science, for the free conduct of discussions, competitiveness of scientific schools and collectives, and for raising the activeness and revealing the creative potential of scientists...")?

However, in my opinion, this is not the main point. We should radically change the logic itself for distributing monetary resources from the sale of scientific research and design work among the employees of scientific research institutes [SRI] and design bureaus [KB]. Within the framework of the existing system, their salary scales should be ranged as follows: 1) generators of ideas (maximum salary scales); 2) "applications workers," the developers of ideas; 3) organizers, research coordinators ("leaders," in the more ordinary sense); 4) those who implement specific projects (scientists, engineering and technical employees, designers, technicians, etc.); 5) "free defenders" (scientists, mainly beginning, who have not yet determined their own profiles); 6) service and maintenance personnel. For all the conventionality of this system, it fundamentally differs from the previous one, which sets the highest salary scales for leaders.

In the future, the same institutional form for organizing and encouraging scientists' labor must be dismantled and replaced by a contract implementation. In this case, the scientist receives his basic earnings according to a contract with a general contractor, having won the right to develop the project, idea, etc., in a competition. Within a certain time period, a collective capable of coping with the set task is formed. Financing and material and technical support are implemented according to the "for an idea" principle, i.e., in strict correlation with the overall estimate of expenses. The scientist's participation in several such "teams" is permissible. A researcher or engineer, unable to conclude a contract with anyone, receives a "demurrage" from the state or from an association of scientific and technical employees (its funds are formed from the members' voluntary deductions)—for instance, at the level of 60-70 percent of the average earnings for a worker or employee in the state sector—and utilizes this free time for self-development, advertising available ideas in the press, etc.).

It is entirely clear that this system of organizing and paying for labor in science offers enormous savings in

funds, above all, by eliminating the ballast of various sorts of leaders and the idlers who "can approach them." The incentives for the truly talented workers are also obvious: besides the sum agreed upon in the contract, they can be encouraged by transferring a certain percent of the profit obtained by the customer due to implementing the ideas proposed by the scientists and engineers.

The "holy rite" of solving cadre and, indeed, all other large strategic problems, if we again address the existing system for organizing science, should be relocated from the directors' offices to the meeting halls of SRI and KB labor collective councils. The latter would also form the certification committees, whose decisions have the sense of being legally considered definitive.

The system of electivity and competitiveness in selecting leaders (coordinators) of various ranks should become total. Incidentally, right now, according to the Law on the State Enterprise, a collective can only choose its line leader (the director, shop chief, brigade leader, etc.). Meanwhile, the other "chiefs" of the collectives are not under their jurisdiction... However, is there really a need to prove that not only the worker's earnings, but also the enterprise's collective income, depend on the activeness and competence of the enterprise's chief engineer, chief economist, etc.?

As long as we have not attained the understanding of the need to decisively break with the system of industrial ministries as the bodies of administrative management and to transfer their healthy, economic functions to free associations of socialist enterprises, like the first soviet companies which recently appeared, we should, it seems to me, discuss the possibility of selecting ministers and their deputies by competition. As everyone knows, the government is now starting the latter. As far as the constitutionally acknowledged procedure for approving

the posts of members of the government itself is concerned, it is only outwardly more democratic. The USSR Council of Ministers chairman presents the candidates for the posts of members of his cabinet at a USSR Supreme Soviet session, according to the "one man for one seat" principle. Under such conditions, the body of people's power can only vote "for" or "against." Incidentally, for the time being there has been no precedent for the latter. However, it seems, this procedure is justified under the conditions of a multi-party system, when the prime minister—the representative of the party which won the elections—"gives" the portfolios of government members to people, capable of implementing his party's pre-election promises. Under our conditions, nothing prevents us from holding a competitive selection of ministers.

It could be reduced to the following. The labor collectives of the sectors' enterprises, associations, and scientific organizations nominate candidates for the government posts, and without restriction. Naturally, the Council of Ministers chairman also "runs" his own candidates. The press, radio, television, and, above all, I suggest, a "State Bulletin," grant the candidates an opportunity to set forth their own program for restructuring the sector (sub-sector) and to enter into debate with a rival. Furthermore, there should be a stage for universal discussion: essentially, the future subordinates, including scientists and engineering and technical workers, representatives of social organizations, consumer associations, and in general, anyone who wants, speak out on the candidature of the nominated competitors. Taking the discussion results into account, the appropriate permanent committees of the USSR Supreme Soviet carry out the necessary selection. A list of, let us say, 8-10 people is presented to the session. Finally, the deputies select the nominated members for state office by secret vote.

Changes in Degree Certification System Urged

18140259a Moscow IZVESTIYA in Russian
17 May 89 p 3

[Interview with Academician Ye. Shemyakin, chairman of the Higher Certification Commission attached to the USSR Council of Ministers, by an IZVESTIYA correspondent under the rubric "Science and Restructuring": "How Much Does a Dissertation Weigh?"; date and place not given; first paragraph is IZVESTIYA introduction]

[Text] The scientific community is discussing the draft of the new Statute on the Procedure of Awarding Academic Degrees and Conferring Scientific Titles. What is new in it as compared with the prevailing statute? An IZVESTIYA correspondent asked Academician Ye. Shemyakin, chairman of the Higher Certification Commission attached to the USSR Council of Ministers, to tell about this.

Ye. Shemyakin: First of all, restructuring gave rise to this draft; its supertask is to create the conditions of particularly favorable treatment for real talented people.

In our country an academic degree is awarded by a specialized council made up of a narrow group of scientists who are most competent in the problems which the dissertation writer is studying. Of course, there is the danger that the narrow group can conspire among themselves. This is a different question: about the moral and social responsibility of the scientist. However, the principle itself is correct. The right to judge is granted to whomever understands the given question best of all in the country. For nothing gave and is giving us such losses as dilettantism and ignorance. The step toward specialized councils was progressive. Hence, it is necessary to preserve them. But to give them more rights. For example, in conformity with the draft of the new statute precisely they will finally award the candidate degree.

They say that it is necessary to treat the doctoral degree the same way. I believe that it is still too early to do this.

Look how that emphases are placed. Specialized councils—the center of gravity of certification is shifting here. And expert councils—analytical work from the standpoint of statewide interests is concentrated here. And then it becomes clear that the Higher Certification Commission is not a monitoring, auditing superstructure, but the link that organizes by means of certification the scientific and technical potential of the country regardless of departmental affiliation (academies, higher educational institutions, sectorial institutes, and design bureaus). This idea stands out through the entire draft.

At times it is said that the American system of certification differs greatly from ours. But the necessary element of nationwide monitoring on the part of either the Association of American Universities or an engineering society also exists there. The version that in the United

States the diploma of one university or college is in demand, while that of another is not, is also popular. But this is connected in many respects with whether the given university has received the endorsement of the association.

In our country there exists the opinion that an academic degree is something like a life annuity. But the system of certification—both the one that exists and the one that is being proposed—merely gives the right to a specific position. It is still a question of whether or not you will hold it.

There are many complaints that a dissertation robs several years of life and not any talented researcher can allow himself this. Do not believe those who assert that he sat and for 1.5 years squeezed out a dissertation. If this is so, no one needs his work.

And what is to be done with those who directly spearhead scientific and technical progress—who develop and produce new technological lines and devise new machines and instruments? For this there are the degrees of candidates and doctors of technical sciences, which can have their own specific nature. For example, it is possible not to write a dissertation, but to prepare a report on one of one's own jobs. But here, too, I consider mandatory precisely a public defense. Why? Because this is also glasnost in science.

Can an academic degree be awarded without the defense of a dissertation? Yes, in exceptional cases, when it is a matter of inventions and discoveries, which ensure the significant acceleration of scientific and technical progress, this can be done on the joint representation of the State Committee for Science and Technology and the USSR Academy of Sciences.

But generally speaking, the form, in which it is possible to defend one's contribution to science as a dissertation, now is not the Procrustean bedstead, which administrators from science tried to make it in still not so ancient times. This can be a massive monograph and just several pages of mathematical calculations (a dissertation of 1.5 pages was the record), a paper and a new textbook. On what kind of scales is one to determine here the real scientific weight? The draft provides in this respect for a wide range of possibilities.

In the draft the bureaucratic formalities are substantially reduced and the rights of degree candidates are increased. It is directly stated that the specialized councils can change opponents, if their conclusions are unintelligible, and can reject the opinions of head organizations, if they are formal replies or panegyrics. And all this is in case of the maximum glasnost.

The fact that we now do not have anonymous, as they say in scientific surroundings, "black" opponents and dissertation writers do not have to fight invisible beings and windmills, is also directly connected with this. Life made it incumbent to do this back before the adoption of the new statute.

A very important question concerns the rights of degree candidates. For example, there is recorded the stand: the degree candidate has the right to acquaint himself with all the documents, in which his name is mentioned, at any stage of the defense and approval of the dissertation. Previously this did not exist. It was believed that certification is all but a state secret behind seven seals, while they saw in the degree candidate himself all but an extortionist and did not see an individual in him. Today one of our priority tasks is: to defend the degree candidate. Against what? Against scientific monopolism, for example. And that is precisely why it is so important in our specialized and expert councils to represent different scientific schools and different, including alternative, positions.

The constant, once every 3 years, change of expert councils serves this purpose. We have 36 of them. And in 1988 their membership was significantly changed—from one-third to one-half.

How are the expert councils now formed? In accordance with the suggestions and recommendations of ministries and departments, the USSR Academy of Sciences, and the USSR State Committee for Public Education. It is necessary to elect them. Let us assume that if we were to have a congress of scientific personnel, it would also elect the chairmen of the councils and would introduce a clear status of its members. We are prepared to submit to the verdict of this congress a number of proposals on how to make the system of certification more responsible to the scientific community.

Of course, any expert collective is not guaranteed against mistakes. But all the same the concentration of the best specialists for expert evaluations, on the condition of the open, democratic struggle of different points of view, is today the optimum means both in our country and throughout the world. And the attempts to replace it with other methods of evaluation (for example, by the index of citation or the economic impact from introduction) seem not very convincing to me.

It is another matter that it is vitally important to invite to be members of our expert councils the most prominent foreign researchers, especially in the fields in which we lag.

The question of complaints is being posed in a new way. The majority of them (I am excluding anonymous letters, which are not considered today by state institutions, and obviously unconvincing objections) merit serious arbitration, which ensures degree candidates a real opportunity to defend their correctness.

We are providing for the development of an appeal system, in case of which a different collective than the one, which made the first decision, will review the dissertation a second time. It is difficult to do this, for there are always not enough first-class experts and they are concentrated precisely in the specialized councils. Then such a high level as a group of members of the plenum of the Higher Certification Commission in the given specialty sets to work, as is being done already now. But in the new statute I would like to see a specific paragraph on the establishment of sections of the plenum of the Higher Certification Commission. These will also be the highest forums of specialists.

I have told mainly about the changes which it is proposed to make in the Statute on Awarding Academic Degrees. But, I believe, it is also necessary to make changes in the Statute on the Higher Certification Commission itself. The Commission of the USSR Supreme Soviet for Science and Technology can revise it. I believe that given the reasonable adjustment of this system of certification it can work effectively. But there might also be different opinions.

True, I do not believe that any new alternative structure, which completely abolishes the Higher Certification Commission, can now arise. Take the same draft of the new Statute on Scientific Degrees and Titles. There were more than enough "revolutionary" statements that it should be completely different, that we do not need the Higher Certification Commission at all. However, no one here names any fundamentally new elements, on which it is possible to build an alternative system, but which would not have already been carefully analyzed here when examining in 2 years 17 (!) versions of the draft of the statute. The losses of constructive, new ideas were reduced here to a minimum.

But if new concepts, which revolutionize our approach to the evaluation of the scientific potential of the country, were still to arise, they should, of course, be considered most seriously at the Congress of People's Deputies of the USSR and at the sessions of the USSR Supreme Soviet, which has been elected by it.

In conclusion I will repeat the main thing: the task of the Higher Certification Commission today is not only to determine accurately and soberly the state of our scientific potential, but also to ensure its increase in the directions, in which the future of restructuring and the future of the country are being decided.

Enhanced Role for Young Scientists Outlined

18140229 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 7 (94), 1989 p 2

[Article by A. Mikhaylov: "'NEP' in the Academy of Sciences." Passage in boldface as published]

[Text] It is a question of a new economic program for encouraging the creativity of young researchers. Unfortunately, presently for many of them the path to large-scale

science is dragged out for more than a decade. The ossified academic structures, low salary, rigid planning of scientific exploration, and the need to think, above all, about defending a dissertation—the only opportunity to improve one's material position, as well as the virtual absence of housing, are the "set" of problems that the young romantic runs into, after crossing the threshold of world-renowned academic scientific research institutes.

Everything listed, one wants to believe, will soon "sink into oblivion," thanks to the organization of the volunteer "Science" society, with a "Science and Youth" fund (reserve), within the framework of the USSR Academy of Sciences [AS]. It is in fact a question of implementing a new economic program for work with scientific youth. It was recommended that all USSR AS scientific institutions and administrations offer the utmost assistance to collectives, participating in the implementation of the economic program for work with scientific youth, and cooperate with "Science" in implementing mutually profitable projects.

The Committee on Work with Scientific Youth, which should present the USSR AS Presidium with the corresponding proposals this May, was instructed to coordinate the fulfillment of this program.

What kind of opportunities are opening up for young researchers now?

Above all, with the assistance of "Science" and its departments, they can participate in fulfilling contracts with various organizations, both on the staff of creative youth collectives, and in other USSR AS subdivisions.

The acceleration and expansion of research to be performed by young scientists will start at the expense of the "Science and Youth" fund and other sources, including on the basis of venture principles, marketing, and the organization of appropriate advertising in order to attract outside funds, including foreign funds and those of organizations, into the Academy. "Science" simultaneously takes up the responsibility for offering all possible assistance in the commercial implementation of academic developments, both in the country, as well as abroad, acquiring modern equipment, including on the basis of barter agreements, and creating joint enterprises.

Another aspect of "Science's" activity is the creation of favorable economic and social conditions for efficiently using young people's creative potential, and involving not only students, but also secondary school students, in doing research on a contract basis in the USSR Academy of Sciences.

Moreover, "Science" will contribute to developing old and working out new forms for exchanging scientific and technical information, will help publish works by young

scientists and the results of work done with their participation, and will create new forms of intra-Union and international scientific ties for young scientists and other associates of the USSR AS.

About housing for scientific youth: it is no secret that precisely the shortage of it is one of the serious reasons for the drop in the prestige of the profession of scientific worker and the outflow of capable young people from the USSR Academy of Sciences and, consequently, also the reduced effectiveness of domestic science. The answer lies in creating long-term youth housing complexes [MZhK] for the USSR AS. However, the traditional MZhK model, in which young specialists forget that they studied at a university and become poorly skilled construction workers for several years, is obviously unsuitable for scientists. Therefore, it was decided that academic MZhK would be built without taking the USSR AS associates away from their basic jobs, at the expense of receipts from fulfilling contract work. The first academic MZhK is proposed to be built in the form of an intra-urban complex, organized according to the "information settlement" principle and equipped with the corresponding computer hardware. Let us add that the USSR AS Presidium has instructed its Committee on Work with Youth, jointly with the USSR Academy of Sciences Main Administration for Design and Capital Construction, the USSR Union of Architects, and "Science," to work during the second and third quarters of this year on the problem of allocating land lots for the first MZhK.

Lastly, on the financial aspect of the matter. "Science" will "live" only on funds from contracts concluded with customer organizations. "Science" should transfer no less than 70 percent of the contract sums to the implementing academic collectives. Naturally, the young researchers will work on contracts during their time off from their basic jobs. If, in this connection, a need to use the "staff" material base of academic institutions arises, the latter will receive the appropriate, previously stipulated compensation. After doing the contract work, the youth creative collective can use the money received to pay awards, acquire needed equipment and materials, or allocate it for the "Science and Youth" fund—in order to build academic youth housing complexes.

If "Science's" work interests our readers, they can obtain all necessary information from the USSR Academy of Sciences Committee on Work with Youth. Its address is: 117977, GSP-1, Moscow, V-334, Kosygin Street, 4. Telephone: 939-73-03.

Dissatisfaction With Pay for VUZ S&T Instructors

18140247a Moscow NTR: PROBLEMY I RESHENIYA
in Russian No 8 (95), 1989 p 7

[Article by Doctor of Technical Sciences Professor V. Shmigalskiy, head of a chair of the Simferopol Affiliate of the Dnepropetrovsk Institute of Construction Engineering: "Equal Pay for Unequal Labor"; first two paragraphs are NTR: PROBLEMY I RESHENIYA introduction]

[Text] It is possible to hear reproaches of present-day graduates of higher educational institutions [VUZ] not

only from organizers of industry and science, but also from publicists and lampoonists, newspaper satirists and singers of satirical songs.

The author exposes publicists and lampoonists, newspaper satirists and singers of satirical songs as one of the key causes of the formed situation.

I have headed a chair for 16 years. And never has an instructor approached me with the request to increase his teaching load or with the proposal to teach a new course that is very urgent for undergraduates. However, I do not want for this reason to cast stones if only at one of my associates.

The point is that other things being equal (length of service, position, degree, title), if one instructor worked a teaching load of 1,000 hours, while another worked half as many, their labor probably will be remunerated equally. Such is the prevailing system of the remuneration of labor. It also stimulates the aspiration to do a little less, to man chairs with the largest possible staff, to avoid the replacement of a colleague, who has become ill or has left on a business trip, and to avoid the study and teaching of new disciplines.

It is also difficult for myself "to be holier than the Pope." Such, too, is the pressure of the prevailing system of the remuneration of labor on the head of a chair.

The standard of the remuneration of labor is in effect over an impressively wide range—in case of a staff of 5 instructors and 30 instructors, in case of an economic contract for 15,000 rubles a year and 10 economic contracts in the amount of 300,000 rubles, in case of 1 educational laboratory and 3 educational laboratories, and in case of the supervision by a chair of 1 discipline and 15 disciplines.

Any supervisor of graduation designing or a consultant, regardless of what the design itself is like—ordinary or out of the ordinary, practicable or not, useful or useless—has the right to record in the performed workload an equal number of hours. In this way the standardizing force of wage leveling is being carried over to our successors, to undergraduates themselves.

In 1986, one female undergraduate, who thoroughly completed a research assignment, submitted a graduation project. I spent more than 100 hours on supervising this work. The defense was dazzling. But what did I record in the workload? What I had been given the right to: 16 hours, just as all other supervisors of graduation designing. Given such "accounting miniaturization of remuneration" will many instructors look after their followers?

Now we most often regret it when a young talented, say, physics instructor leaves for an apartment repair cooperative or organizes at an airport the showing of video cassettes. But he is young; his favorite physics does not

provide him even with a subsistence wage. And precisely at that delicate age, when he ought to make a family or set on its feet the family that has just been formed. And in VUZ lecture halls and laboratories, the connection of the times and generations is broken—there is neither continuity nor progress.

Precisely wage leveling has brought our society to a precritical state. Not having been overcome at the higher school, it merely gives this most dangerous state a dynamism that is destructive for the national intellectual potential.

As I believe, it is possible to overcome this trend only by the strict rate setting of the hourly workload of the VUZ instructor. But not as it has been thus far, the maximum workload, but, on the contrary, the initial workload. It should clearly record the minimum expenditures of the time needed for productive work, only with which the remuneration of the labor of the instructor can begin. But it should not restrict at all the maximum and, of course, efficient expenditures, just as their remuneration.

This complete change in the principles of rate setting and remuneration will turn everything upside down. If the possibilities of the labor of an instructor—physical, intellectual, skill, and, finally, creative—enable him to "support" suppose 5, suppose 10 standardized workloads, none of the large number of rubles paid to him will be a waste for society. Especially if behind his large "sums written out in words" there are without exception only, say, graduates with "red diplomas" and innovations that have been implemented on an industrial scale. Here, by the way, the now very attractive system of cooperatives will not be competitive with respect to higher educational institutions. And the best personnel will remain here.

And an end to leveling and mediocrity in the work of the VUZ corps of instructors and among graduates will begin. For mediocrity and conventionality reproduce both restrictive standards and restrictive rate setting. This mechanism will come at once to a standstill, as soon as we lift the restrictions of the expenditures of time and the remuneration of labor, which were invented in offices that are so far removed from VUZ lecture halls and laboratories. The remuneration and, we will face the truth, the output of the instructor, which depends on it, will begin to depend not on the frail "fantasy" of ministerial officials. They will begin to depend only on himself, his own possibilities, creative store, and spiritual generosity. A place will not remain either for stagnation or for "standardization."

Of course, there is something to say both about the calculations of the new standards and about the procedural principles of the new rate setting—not to me alone, to the entire community of instructors and to the "users" of our "product."

The proposed time indicator, so it seems to me, for the present is most rational. Given the elaboration of improved standards and the consideration of the most important forms of activity of instructors it, I believe, will work, after all, for the elimination of wage leveling, the improvement of work, as well as social justice at higher educational institutions.

You would say none of this about the "spread of salaries," which is now being planned. Given all the semblance of a means of combating wage leveling trends, in the hands of zealous administrators it is quite capable of being a reliable means of discrimination against "awkward" people. For objective criteria of the evaluation of the work of instructors are not envisaged by the "spread."

Such possibilities, however, are incorporated in the already prevailing system of the four-sided monitoring and evaluation of the work on an instructor on the part of the head of the chair, the office of the dean, the office of the rector, and surveyed students, as well as in the practice of open lectures.

It is necessary, finally, to put an end to equal pay for different labor. Its economically and morally destructive power can be seen with the naked eye. While the particular harmfulness for higher educational institutions, where new generations of the domestic intelligentsia are formed, is self-evident.

New Computer Program Aids Nuclear Physics Students

18140247b Minsk ZNAMYA YUNOSTI in Russian
26 Mar 89 p 2

[Article by BELTA correspondent D. Patyko under the rubric "We and the Computer" (Minsk): "Undergraduates Are Learning 'Effortlessly'"; first paragraph is ZNAMYA YUNOSTI introduction]

[Text] The undergraduates of the Belorussian Polytechnical Institute can now conduct any most difficult experiment in the field of nuclear physics without traveling to the Serpukhovo Accelerator. For this it is sufficient to cross the threshold of the first display classroom of the mathematical simulation of physical processes in the republic, which has been opened at the higher educational institution. It enables future specialists with the minimum expenditures of time and the maximum efficiency to perform laboratory work on computers. It is sufficient to feed into the machine the initial data of the experiment, and the electronic assistant then and there, while illustrating the actions with color moving diagrams and explaining on the screen its every move, will solve the problem.

Here the role of a passive observer is not assigned at all to the undergraduate; he becomes a participant in a fascinating dialog: he asks the machine questions, answers the computer, and as a result easily masters the

most difficult theme. Having taken upon itself all the routine work, the machine frees time for the future specialist for the analysis of the obtained results and the thinking over of the material.

The programs, which were written by instructors of the higher educational institution, make it possible to demonstrate experiments in all the basic sections of physics and serve as an excellent supplement to the series of lectures. They are also good for the fact that they make it possible to correct instruction promptly in conformity with the latest achievements of scientific thought. Such an automated system is especially effective in junior courses, where undergraduates receive a basic training.

The first months of operation of the classroom showed that the level of knowledge of undergraduates increased significantly. Pupils of the upper grades from the affiliated school are also spending time beneficially at the displays.

Today all the instructors of the polytechnical institute have completed the computer technology courses that are in operation at the Belorussian Polytechnical Institute, while in the future it is planned to open on the basis of the classroom a republic center for the improvement of skills.

Lagging Pace of Computerization in School System

18140259b Moscow PRAVDA in Russian
12 May 89 p 2

[Article by G. Yastrebtsov: "The Class Computer. When Will School Children See It?"; first four paragraphs are PRAVDA introduction]

[Text] "What can you say about class computers?" I asked my son.

"Well, the Japanese have high-class computers; in the States they also do...."

"But I am not talking in the sense of quality; I am talking about school."

"Oh, I see. We have a computer classroom. Once a week we study information science there. True, mostly on paper. The seven Agats are something like an expensive decoration. I do not remember them turning them on...."

The situation is typical. Of the 135,000 Soviet schools only 9,000 (7 percent) have 1 computer classroom each. For comparison: in developed capitalist countries each school is equipped with computer hardware at the rate of 1 computer per 10 students. Such machines for a long time now have also not been a rarity in families. During foreign business trips, I have had occasion to see children willingly sit down at home computers. Skills for further training and serious work with computer hardware are acquired in an initially simple game.

Over 3 years ago, at the 27th CPSU Congress, a goal was set: to engage more thoroughly in our general educational school in the study of the scientific principles of modern production and the leading directions of its intensification. And, what is particularly urgent, to ensure the computer literacy of students.

Why have we been marking time so long?

"Prior to 1988," F. Peregudov, deputy chairman of the USSR State Committee for Public Education, explains, "three departments of our system were simultaneously responsible for informatization. But, as is known, too many cooks spoil the broth. They duplicated and did not work in concert on many questions. Now we are trying to organize the work in this direction more efficiently and systematically. In the central apparatus of the USSR State Committee for Public Education they established a special group for its coordination. Moreover, there is an interdepartmental commission, which has formulated a long-range concept of the informatization of education. The decree of the CPSU Central Committee and the USSR Council of Ministers 'On Steps on the Assurance of the Computer Literacy of Students of Secondary Educational Institutions and the Extensive Introduction of Computer Hardware in the Educational Process' is gradually being implemented. In the last 2 years nearly 9,000 offices of computer technology have been opened, which is making it possible to familiarize about 20 percent of the school children with practical work on computers."

"But this is very few, and the quality of instruction, judging from the letters of PRAVDA, is low."

"Of course, there are enough unsolved problems. Here is just one of them. Now the offices of computer technology are equipped with more than 10 types of computers: the Agat, DVK-2M, DVK-1M, Elektronika DZ-28, Elektronika BK-0010, Iskra-1256, Robotron, the SM computer, the YeS computer, as well as the Yamaha and KUVT-86 educational computer systems. Unfortunately, all the listed computers, with the exception of the Yamaha educational computer system, which was purchased 4 years ago in Japan, do not meet the requirements of the educational process. They lag behind foreign computers in technical characteristics and functional capabilities and are one-tenth as good in reliability and performance."

"The fact that the video monitors, which make up a part of the computers, do not meet the public health norms, which have been adopted in our country, and are detrimental to the health of children, is arousing particular anxiety. For this reason the USSR Ministry of Health was forced to limit the work of students at computers to 20 minutes a day...."

As we see, the situation with the computerization of the domestic school is very alarming. A recent check, which the USSR Committee of People's Control made at

plants, associations, and institutes of the USSR Ministry of the Electronics Industry, the USSR Ministry of the Radio Industry, and other ministries, which are engaged in the development and production of computer hardware, also confirmed this. In 3 years only 63,000 school personal computers—60 percent of the assignment—were produced there. The plants of the Ministry of the Electronics Industry last year supplied schools with 345 computer classrooms—one-sixth as many as planned. The enterprises of the Ministry of the Radio Industry "completed" 20 percent of the deliveries. This year the situation is no better. No plant coped with the plan indicators.

The Nauchnyy tsentr Association of the USSR Ministry of the Electronics Industry was commissioned to develop a modern computer hardware complex with a capacity of 1 million operations a second. However, thus far even the technical assignment for the designing of such an item does not exist. Meanwhile, the managers of the scientific production association are writing in reports that everything is in order, another complex—the UKNTs—has been developed. Its capacity alone is ten-seventeenths as much as the required capacity, and this is not a trifle. It seems that the Nauchnyy tsentr Association also regards as an insignificant circumstance the upsetting of the plan of the series production of the same UKNTs's. Last year less than half of them were produced, due to which at educational institutions they were short nearly 2,000 computer classrooms. While for the producers it is like water off a duck's back.

Instead of speeding up the development of truly new, advanced equipment, at the Nauchnyy tsentr Association they are continuing with a calm feeling to "rivet" the obsolete KUVT-86 complexes, which in practice are useless for education. What is more, in trying by any methods to report back on the fulfillment of the assignment, General Director Yu. Dyakov acquired permission to deliver to schools complexes, which do not conform to the specifications on reliability. As they say, my God, what is not suitable for us. Last year and during the first months of this year alone such unreliable items worth 34 million rubles were shipped to educational institutions of the country.

The association is operating under the conditions of full cost accounting and self-financing. But is this of much good for consumers? As before they are drawing up the design documentation with a delay and poor quality, the monitoring of the preparation of production of new equipment and components is poor. Elementary slipshodness and gross violations of technological discipline are also not a rarity at the plants. From where is good quality to come? Not by chance did all the school computers, which were taken from the warehouse during the check of the Eksiton Plant and Solnechnogorsk Electromechanical Plant, prove to be defective.

But here is the Kvant Plant, at which V. Polatayko is the director. It would seem that this enterprise has everything necessary for the output of good-quality modern

items—the shops are filled with expensive imported equipment, automatic machines, and robots. One thing is lacking—responsibility for the assigned job. Here they are simply ignoring the requirements of the standard technical specifications. In pursuit of quantitative indicators the managers of the plant ordered the necessary burning in of complexes to be cut in half—from 48 to 24 hours. Looking to the "initiative" of superiors, the workers of the assembly shop also began to reduce without permission the amounts of acceptance tests. Due to this consumers received more than 500 complexes, which do not ensure the output of graphic information, and, if we are to be more specific, defective complexes.

With the knowledge of its director the Kvant Plant shipped without adjustment, burning in, and acceptance by the technical control division about 3,000 school computers. All of them were included entirely illegitimately in the reporting documents. In other words, items worth 7.78 million rubles were overreported.

School children and teachers in all corners of the country cannot wait for computer hardware, but at the Kvant Plant they have turned a scarce product into a kind of currency, handing it out left and right according to the well-known principle "if you give to me, I will give to you." Here, for example, the managers of the plant report: so many computers were shipped to enterprises and organizations supposedly in order to supply sponsored schools, *tekhnikums*, and vocational and technical schools. They checked whether this was the case. It turned out not to be so. On the direct instructions of managers of the plant, including the director personally, they provided with school personal computers and computer classrooms the main computer center of the USSR Ministry of Nonferrous Metallurgy, the Pushchino City Military Commissariat, the Leningrad Higher Fire-Fighting School, and several medical institutions of Moscow. This is done at times for specific services. Thus, the Yevpatoriya Travel Bureau in exchange for school computers offered travel authorizations to the Crimea, the Severodvinsk Sevmashpribor offered travel authorizations to a Pioneer camp, while one of the Shebekino enterprises offered a truck body.

I would like to know what Deputy Minister of the Electronics Industry E. Ivanov, who is directly responsible in the sector for the development and production of school computers, thinks about all these schemes. Incidentally, he himself, it turns out, is under the thumb of the directors of plants. Here is just one fact. Last year the managers of the same Nauchnyy tsentr Association turned to the deputy minister for permission to produce the KUVT-86 systems, the reliability of which, as the reader remembers, does not meet the requirements of the specifications. Well, was Ivanov outraged and did he categorically reject this essentially illegal request? No, he was not outraged and did not reject it, thereby having sanctioned the padded figures.

In the USSR Ministry of the Radio Industry they are also treating no better the needs of public education. This ministry planned for 1988 for the Baku Radiostroyeniye Association 2,685 Korvet educational complexes. The plan was upset. They shipped to schools only 540 units. However, the enterprising general director, K. Alyshev, even in such sad circumstances was able not to pass up his own gain—he shipped 240 complexes "on the side." Moreover, 194 of them were shipped without allocated assets at all. The general director is confident that he is thinking progressively and in an entirely modern way: it is a sin not to take advantage of the lever of a shortage. Children for the present are managing without computers, while the Moscow Soyuzkontsert Association, the Baku Azsovetkurort, the Rostov Ellips Cooperative, and the Leningrad Variant Cooperative supposedly simply need them very much.

Comrade Alyshev is not only the general director, but also the chairman of the commission for the acceptance of the trial batch of Korvet complexes. And in this capacity he also made an appreciable "creative" contribution: he concealed the lack of conformity of the items to the requirements of the specifications on reliability. As a result, the personnel of the enterprises happily reported the fulfillment of the plan of the assimilation of new equipment and received (absolutely undeservedly) a bonus in the amount of 52,700 rubles.

At the Radiostroyeniye Association they are also allowing the direct padding of figures. For example, last year 38 Korvet complexes did not completely undergo so-called technological runs. They also did not present them to the staff members of state acceptance. Nevertheless, these items worth 950,000 rubles all the same were included in the report. It would be interesting to find out whether Deputy Minister of the Radio Industry E. Filtshev knows about this "forgery."

I am telling in such detail about the negative aspects of the work of enterprises of the USSR Ministry of the Electronics Industry and the USSR Ministry of the Radio Industry, because an important state matter has been assigned precisely to these ministries—to provide schools with computer hardware. As we see, the task is being accomplished in far from the best manner. For the sake of fairness I will say that not only the named departments are to blame for this. Cooperating enterprises and suppliers of component items also deserve well-founded reproaches. Here are the facts. "Thanks" to the USSR Ministry of the Communications Equipment Industry thus far we do not have video monitors that meet the public health norms of the Ministry of Health. It is surprising that here they are not even planning the bringing of series-produced units up to these norms. Enterprises of the sector are also making a mess of deliveries of existing video monitors. One of the Novosibirsk plants last year "coped" with only 15 percent of the obligations on the shipment of video monitors to the Baku Radiostroyeniye Association.

The USSR Ministry of Instrument Making, Automation Equipment, and Control Systems is poorly assimilating the series production of printers for class computers. During the year this ministry delivered to the Ministry of the Electronics Industry only 204 items—1.5 percent (!) of the assignment. Such devices had to be purchased abroad, having invested 30 million foreign currency rubles. A "practical approach," I must say.

Not that long ago I had a conversation with one of the leading specialists in computer technology. I asked why matters with the computer literacy of school children are so sad. "If it were only school children!" my companion replied with bitterness. "Throughout the world there is a real boom of the computerization of all spheres of life, but in our country at many respected institutions they are still clicking the balls of the antiquated abacus or are turning the handles of adding machines. The level of our computer production (the amount of machine storage, the run of high-speed machines, and so on) ranges

somewhere between 0.1 and 1 percent of the American level. The situation is truly dramatic. So try in some way to understand the ministers—they are held accountable first and foremost not for school computers...."

A familiar argument. On holidays we solemnly proclaim: "Children are our future, they are the only privileged class in the country!" But when it comes to everyday worries, in which not lofty words, but specific assistance and support for "the privileged class" are needed, they wave it away like a troublesome fly: "Children? Nothing will happen with them—they will wait, they have their hands full with other worries."

Time relentlessly marches on, while the question of when our class computers will become truly class ones, is still in its old place. Will we adults understand, will we realize at last the simple truth that it is at least short-sighted to plan the future of the country in accordance with the remainder principle?

USSR 'Lacks Preconditions for Information Society'

18140258 Moscow SOTSIALISTICHESKAYA
INDUSTRIYA in Russian 21 May 89 p 2

[Article by SOTSIALISTICHESKAYA INDUSTRIYA special correspondent S. Panasenko (Suzdal): "A Life at One's Bidding? No, There Is an Alternative—an Information Society"; first paragraph is SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] Scientists want to force us to pay 1.5 trillion rubles during the next 15 years. For what? It turns out only so that our children and grandchildren would not grow up to be "second-rate" people, and for their future, which is unthinkable without free access to the most diverse information. In other words, without the informatization of all aspects of our life. Precisely this "immense" task was spoken about at the international conference held in Suzdal, where many people noted with bitterness that in this area we have also fallen behind and let the moment pass. The costs might be even more if we are not able to get rid of ossified dogmas and the inertia of thinking.

The Challenge of the Times

Informatization today is becoming the sphere, which in the pace of development, the dynamics of capital investments, and the volumes of output is confidently outpacing all others. Thus, for example, in the U.S. gross national product software already in 1985 accounted for 8 percent—approximately the same amount as agriculture, the automotive industry, and the extractive industry, taken together, yielded. While the contribution of the communications industry came to 3.2 percent. In our country communications provides less than 1 percent of the gross national product, while the share of software is even less.

Specific goals are behind this trend. On one time the countries, which completed the industrial revolution earlier than others, for decades guaranteed themselves world leadership and their citizens a high standard of living. Now, on the threshold of the information revolution—and specialists are foretelling precisely it—the most different states, be it Switzerland or Japan, sparing no money, are feverishly developing concepts of the building of a so-called information society. They are linking with it not simply a leap in the standard of living, in the comfort of existence, and in working conditions. There is a more serious motive—fear. It will remain and will exist, according to our present standards, perhaps, even rather well. But, as Professor D. Chereshkin stressed at the conference, this will be "a life at one's bidding." With all the ensuing economic and cultural consequences.

It is difficult to avoid this. In the opinion of specialists, in the information society the bulk of the population (according to American data, not less than half) and the

basic resources will be put to use not in the production of material wealth, but in the sphere of the generation and dissemination of knowledge as a commodity. But, even if we take just the economic side, far from everyone can "afford" this. Here all the advantages are obviously on the side of the countries that have accumulated a powerful scientific and intellectual potential. Will we be able to compete with them?

The 1.5 trillion rubles, which were named by Ukrainian cyberneticists, are on the average 100 billion rubles a year. For comparison: the expenditure portion of the entire annual budget of the country comes to approximately 400 billion rubles. How can one not hesitate here?

The conclusion of Doctor of Economic Sciences Y. Kanygin from the Institute of Philosophy of the Ukrainian SSR Academy of Sciences, which was heard from the rostrum, astounded many people. Including the Americans, whom he cited. In particular, he stated that in readiness for informatization our country holds...62d place in the world! While the shock caused by these words was wearing off, the overall mood became more and more clear: the real prerequisites for informatization do not exist in the country. "The mass consumer under existing economic conditions is not yet ready to accept new means and does not see the possibilities of their use for solving his, the consumer's, vitally important problems," that is the conclusion to which scientists of the Institute of Cybernetics of the Ukrainian Academy of Sciences, who formulated one of the concepts of informatization, came. The authors of two other versions of it—associates of the All-Union Scientific Research Institute of Systems Research of the USSR Academy of Sciences and the All-Union Scientific Research Institute of Problems of Computer Technology of the State Committee for Computer Technology and Information Science—also agreed with them. The shortage, the dictation of the producer, the lack of stimuli for taking risks and normal market relations—all this is making information exchange necessary. But the rapidity and reliability of data are valued only in exceptional cases.

Equipment and Technology

The "gentlemen's set" of attributes of the information society is today already well known and even generally accepted. This is a system of public data banks—general-purpose and specialized—which satisfies the needs. This is a branched communications network, which is accessible to every citizen. This is the computerization of all aspects of life. This is the right and real possibility for any of us to obtain needed information immediately. Of course, with the exception of that small portion of it, which constitutes a state, commercial, or private secret. But this portion should be defined by the law, and not by the instructions of an ordinary department.

What do we have? If you take data banks, however paradoxical it is, they do exist in the country. Only no one can seriously say how many of them there are, where they are, and what kinds there are. A. Antopolskiy, head of a laboratory of the All-Union Institute of Intersectorial Information, who engaged in a survey of sectorial systems, cited an interesting statistic: approximately 10,000 databases and data banks are operating more or less successfully in the country. Of course, their technical equipment and the possibilities of the retrieval and transmission of information and of interfacing leave much to be desired.

The situation with communications networks is worse. In the number of telephones—12.4 per 100 inhabitants—we have fallen far behind many industrial countries and are one step above Uruguay. In Sweden this indicator is equal to 92.4; in the United States—90.5; in Canada—66.8. Moreover, we have hardly any telexes, while many of our personnel have not even heard of such terminal devices of the new generation as videotex, teletext, and telefax. Fiber optic communications lines are in their infancy: in all there are 860 kilometers as compared with 1.5 million kilometers in the United States. The reliability also leaves much to be desired: according to data of the USSR Ministry of Communications, the domestic unified automated communications system is capable of serving without detriment to quality no more than 1 million user terminals. It is possible to argue whether we should channel assets into the improvement of these communications channels or, as many people suggest, establish special ones. But we obviously cannot manage without major investments in telecommunications.

Computers

According to the roughest estimates of specialists, in the national economy there should be about 20-25 million personal computers alone. To all appearances, this number was obtained by the simple recalculation of American statistics. Alas, for the present no one can know the real need for personal computers. As A. Bernshteyn, head of a laboratory of the Central Institute of Scientific and Technical Information of the USSR Ministry of the Electrical Equipment Industry, noted, in this regard only very unintelligible arguments exist. It is clear only that the 1.5 million personal computers, which are planned for the next five-year plan, are a drop in the ocean.

However, having noted this dreary prospect, many speakers immediately cautioned: it is hardly advisable to increase the production of our unreliable and inefficient personal computers. In their opinion, it makes sense to buy abroad a large batch of good machines and to sell them to enterprises—in order to alleviate the initial shortage and to beat down speculative prices.

At the conference alarming trends also appeared. In particular, the attempts to depict the problem of informatization as something that has a bearing only on the

sphere of production and science. Meanwhile the information society, as was already noted, should be distinguished by full access to any information—political, scientific, economic, sports, and cultural. And how is it possible to separate them from each other? "Every organism is held together by the existence of means of the acquisition, use, storage, and transmission of information," Norbert Wiener wrote in the book "Cybernetics," which was published 40 years ago. "In a society, which is too large for direct contact between its members, such means are the press (books and newspapers), radio, telephone communications, telegraph, the mail, the theater, the movies, the school, and the church." From this standpoint the information society is an open and democratic society. And, consequently, each step along the path of democratization makes our country more information-oriented.

Of course, democratization is only one of the conditions. The informatization of the country will require immense work and enormous manpower and material resources and industrial and construction capacities. How is this work to be organized, how is it to be managed, who will be responsible for it?

Together With Everyone

If you put aside the details, there are only two means of accomplishing this task: one is to spread informatization, the other is to spread the prerequisites for its development.

The first line is expressed most consistently in the concept of the All-Union Scientific Research Institute of Problems of Computer Technology and Information Science—the head organization of the State Committee for Computer Technology and Information Science. "We do not have the time to wait until a demand for informatization arises," V. Gadasin, its representative, stated at the conference. In the strategy suggested by this collective there are named as "problem number one"...the raising of the technical level and the increase of the output of computer hardware and means of information science. Moreover, it is proposed to channel three-fourths of their volume into the sphere of physical production and its management. This is being proposed, of course, in the name of our lag behind the United States.

But then the appeal "to catch up" naturally runs over into the requirement of the maximum centralization of efforts. And a national economic complex made up of several ministries, which is managed by the Bureau of the USSR Council of Ministers for Information Science, appears in the concept of the All-Union Scientific Research Institute of Problems of Computer Technology and Information Science. This organ concentrates in its hands assets, state orders, and finances, even the specialized State Bank of Information Science is included in the

complex. In short, the personnel of the State Committee for Computer Technology and Information are able not to fear reductions of the staff—it will probably increase.

U. Agur, director of the Estonian Scientific Research Institute of Scientific and Technical Information and Technical and Economic Research, called such an approach "traditional in the worse sense." In the report of the Central Institute of Economics and Mathematics of the USSR Academy of Sciences such proposals were characterized as an attempt "to create over the still embryonic very specific production base an organizational superstructure, which is unwieldy and does not conform to it in principle." But when L. Sumarokov, deputy chairman of the State Committee for Science and Technology, acknowledged that "the problem of the attractiveness of the state order in priority, science-intensive areas of activity as before has not been solved," it became clear that the bureau being planned will not have other levers besides the rusting administrative command levers.

What has been said does not imply that anyone made the appeal to keep the state from participating in informatization. But having been bred on a large number of examples, the fear of bureaucracy tipped the scale in favor of a national program, the implementation of which the Commission for Informatization of the USSR Supreme Soviet would undertake. In proposing this solution, scientists of the All-Union Scientific Research Institute of Systems Research of the USSR Academy of Sciences believe that the commission could deal with budget allocations and the monitoring of their use and with the formulation of legal, credit and tax, and economic policy for the purposes of stimulating informatization and would study proposals of the Council of Ministers, the State Planning Committee, and other organizations. As foreign experience shows, such, as if indirect, participation of the state in the implementation of major projects often proves to be far more effective than immediate directive management.

At the conference nearly everyone spoke in one way or another about how informatization should be carried out. Among the voiced opinions the arguments about a minimum program, which it is possible to begin implementing already now, without resorting to expenditures of billions of rubles, aroused particular interest. It was a matter of increasing the openness of our society and reducing the secrecy.

Many people spoke about the necessity of the broad participation of our country in the international division of labor. Including Professor Seymour Goodman of the University of Arizona, one of the most authoritative specialists of the United States in the field of informatization. "Today no country of the world," he stressed in addressing the conference participants, "not the United

States, not Japan, not Western Europe or Brazil, can venture to engage in informatization alone. None of them is capable of independently developing world-level technologies."

At the conference the words about the unique nature of the situation in our country and about the search for "our own way" and a certain "socialist informatization" were heard as an obvious contrast to this opinion. But these "theses" did not receive support. The majority of scientists and specialists believe that only participation in world information exchange and in the exchange of advanced technologies will help us to create an information society. Any "separatism" in this area creates the threat of an even greater lag.

But then another thesis—concerning "the seats of informatization"—was greeted at the conference with understanding and liking. U. Agur, director of the Estonian Scientific Research Institute of Scientific and Technical Information and Technical and Economic Research, M. Arapov, a senior scientific associate of the All-Union Institute of Scientific and Technical Information, and B. Yelepov, director of the State Public Scientific and Technical Library of the Siberian Department of the USSR Academy of Sciences, advanced it, without conspiring. Different regions, they reported, have a different degree of readiness for informatization and a different network density and provision with computers. Moscow, Leningrad, Novosibirsk, and the Baltic republics have advanced farther than others along the path of informatization. If they are squeezed into the framework of "uniform" informatization, they will be in the position of sport masters, who have been forced to run on the same team as sportsmen of the third category. So is it not better to create for them favorable, preferential conditions of development, having turned them into kinds of "seats of informatization"? Then with time the same Novosibirsk will become in relationship to the nearest cities something like Japan in relationship to South Korea. And with its help informatization of the "neighborhood" will proceed more rapidly and with fewer efforts. Time will tell whether this will be the case.

More Resources Needed for Artificial Intelligence Research

18140232 Moscow NTR: PROBLEMY I RESHENIYA
in Russian No 7 (94), 1989 p 7

[Article by Professor D. Pospelov, doctor of technical sciences: "Artificial Intelligence: Our Problems and Difficulties"]

[Text] The appearance of electronic computers did not take our country unawares. Almost simultaneously with the creation of the computer in the United States and in other advanced countries, computers of the same level also appeared in the USSR. In the course of the first decade of computer hardware development, not only were the USSR's successes in this field not inferior to those in the West, but in many ways even surpassed

them. The gap between the level of computer hardware in advanced countries and in our country began to grow rapidly only when our lag in the technology for producing microcircuits began to increase.

Under the conditions of this lag, we somehow overlooked the second point for developing scientific and technical progress—the appearance of industrial models of intelligent systems. In the U.S., Japan, Great Britain, and a number of other countries, a new branch of industry arose in the 1970s, producing and selling expert systems and other forms of intelligent systems. In the general opinion of specialists, by the end of our century and in the beginning of the next, work in this field will determine the face of society and the state.

The point is that the new generation computers cannot be created, if no so-called intelligent interface appears. In other words, the mass computerization of all spheres of human life is impossible without making computers accessible to everyone at the same level of complexity as a television, VCR, or automobile. Only this can ensure the complete integration of computers into the fabric of our daily existence. Yet, an intelligence interface, which provides for this method of computer operation, in which a person does not have to know either the internal structure of the computer, or how to write programs to solve problems, cannot be created without using the achievements of artificial intelligence.

Therefore, if work on artificial intelligence is not developed actively in the USSR, then the new generation of user-friendly computers, capable of solving the task of the mass computerization of society, will never appear in our country. Under these conditions, we are threatened with the fate of being placed among the ranks of underdeveloped countries, unable to actively influence the world level of progress.

Because of the term "artificial intelligence," which is not too apt in the Russian language, we have lost a great deal of time and neglected many opportunities for developing quite necessary research in the USSR. We are only just beginning to realize the full depth of our loss.

Twenty years were needed (an enormous period of time for the 20th century), for research in artificial intelligence to begin receiving official acknowledgment and for the USSR Academy of Sciences to direct attention to it. At the end of 1987, the Scientific Council on the "Artificial Intelligence" Problem, chaired by Academician G.S. Pospelov, was formed by a USSR Academy of Sciences presidium resolution.

However, this council can do little to change the situation that has been created in our country. It operates on the basis of social principles and has no levers whatsoever for influencing the development of work on artificial intelligence. Its role has been reduced to coordinating the efforts of collectives and specialists which are already working, and to providing moral support for their undertakings.

In November 1988, on the initiative of the USSR Academy of Sciences Scientific Council on the "Artificial Intelligence" Problem, the First All-Union Conference on Artificial Intelligence was held in the city of Pereslavl-Zalesskiy, where one of the youngest Academy of Sciences institutes, the Institute of Software Systems, functions. Three hundred-eighty people participated in it.

Is this many or few? Let us show the number of participants in national conferences on artificial intelligence held in different countries in 1987-88: in the United States—5,000, Japan—2,000, Great Britain—700, and Switzerland—450. Like the conferences in other countries, an exhibition of ready-made intelligence systems was held in Pereslavl-Zalesskiy. It exhibited 27 models. The corresponding figures for other countries are: the United States—487, Japan—404, Great Britain—254, Switzerland—76 (!). The conclusions that suggest themselves are of little comfort. Let me quote the bitter words contained in the text of the conference's summary document: "Against the background of the revolutionary changes in modern information technology, the situation in our country, without any exaggeration, should be characterized as catastrophic. We lag by a factor of 10 in terms of the volume and scale of work, and by a factor of hundreds—in terms of the scales of financing and technical equipment. Not a single institute in the country specializes in artificial intelligence, not a single journal is published, and the training of cadres is virtually nonexistent."

For comparison, let us note the number of organizations, specially engaged in artificial intelligence research: in the U.S.—206 research groups and 185 companies, specializing in the production of intelligence systems, Great Britain—42 research organizations and 38 specialized companies, Italy—17 research organizations and 7 specialized companies. These data are for the last half of 1987.

Throughout the world, more than 150 journals are now being published, reflecting one aspect of artificial intelligence or another. For already about 10 years, virtually all leading educational institutions in the U.S., Japan and the European countries have been training literally an army of specialists, whose profession is artificial intelligence and intelligent systems.

A particular feature of interdisciplinary research, which includes artificial intelligence research, is the need to unite the efforts of the most diverse specialists: logicians, psychologists, programmers, linguists, knowledge engineers, and many others. Such unification is only possible given the presence in the country of a program, having state status, for developing research. Unfortunately, to this day there is no approved program in the USSR, within the framework of which it would be possible to most effectively utilize resources for achieving a world level in artificial intelligence.

While realizing that the vertical structure of management and resource distribution that has taken shape in our country over many years will be unable to support the development of work to create intelligent systems, just as it was unable to provide us with a standard policy for developing computer hardware, a special agency must be created to manage a state artificial intelligence program, which would be allocated extraordinary authorities, comparable to those which were implemented for handling programs, vitally important for our country in their day, such as the creation of nuclear weapons or the launch into space. We cannot do without this, if we do not want to admit defeat in the competition with the most developed countries.

Meanwhile, the participants in the First All-Union Conference on Artificial Intelligence adopted a resolution on

the need to organize an Artificial Intelligence Association, whose constituent congress is planned for the first half of 1989. The telephone line of the scientific secretary of the USSR Academy of Sciences Scientific Council on the "Artificial Intelligence" Problem is given as the line for communicating on all problems related to organizing the association: 135-32-98. Many specialists hope that the appearance of this association will make it possible to solve many very urgent problems and will energize the organization of work in this field, which they have chosen as their profession.

The hope that combining the efforts of state and social organizations will shift the situation from a standstill has not yet been lost. We simply have no other way.

New Association Sells Inventions, Innovations
18140248 Yerevan KOMMUNIST in Russian
25 Apr 89 p 2

[Interview with Eduard Gurgenovitch Grigoryan, director of the Innovatsiya Scientific Production Organization of the Introduction of Promising Developments and Patent Information Research, by a KOMMUNIST correspondent under the rubric "We Present a New Organization": "The Goal Is Introduction"; date, place, and occasion not given; first two paragraphs are KOMMUNIST introduction]

[Text] The Innovatsiya Scientific Production Organization of the Introduction of Promising Developments and Patent Information Research has been established in Armenia.

A KOMMUNIST correspondent talks with E. Grigoryan, director of Innovatsiya, about the tasks, functions, and rights of the new scientific subdivision.

KOMMUNIST: Eduard Gurgenovitch, what is the basic goal of the establishment of your organization?

E. G. Grigoryan: You know how intolerably long the path is from development to introduction and how many losses we incur on this path. Especially when this concerns valuable promising developments that are capable in case of their timely introduction of being of enormous benefit.

The main task of Innovatsiya is to identify such most valuable proposals and to ensure their rapid introduction. These developments can be of the most different directions: ecology, the efficient use of raw material resources, the recovery of industrial waste, the assimilation of waste-free technologies, and so on.

Moreover, we will give ministries and departments assistance in the determination of the technical level of developments, new items, materials, and technological processes and in the drawing up of applications for inventions.

KOMMUNIST: The amount of work is quite large. But what possibilities and rights do you have for its fulfillment?

E. G. Grigoryan: Being a cost accounting, self-financed, cost-recovery organization, Innovatsiya can conclude contracts for the conducting of research, for a development, and for the making of production prototypes or pilot experimental batches of items.

Innovatsiya has the right to establish within it commercial and cooperative banks. The assets of these banks are formed from the deposits of shareholders in the person of state enterprises, organizations, and cooperatives, credits obtained from USSR special banks, the personal deposits of citizens, and the deposits of foreign firms, associations, and banks.

Innovatsiya has the right to establish in its structure design, planning and technological, scientific research, and pilot experimental integrated subdivisions, production sections, cooperatives, and temporary creative collectives. The specialists needed for the given specific job, regardless of their basic activity, can join these collectives. Here the restrictions, which are established by prevailing legislation, do not apply to them.

For the purpose of expanding our activity we have been given the right to establish joint ventures with domestic and foreign partners on cooperative terms. Here the amounts of work are not planned, the output being produced is not limited and is sold at contract prices.

We also intend to make intermediary services available to firms and organizations of the CEMA member countries and capitalist and developing countries in the area of export-import and licensing operations.

KOMMUNIST: And, finally, a last question: How will your contacts with partners be implemented, what is the system of your interrelations?

E. G. Grigoryan: So that it would be clearer, I will explain using a specific example. Assume that a medical institute or any of the scientific research institutes has proposed an interesting promising apparatus, which it is possible to use more successfully in surgical operations.

Such an apparatus is urgently needed. But the developers know perfectly well how much time will be needed in order to prove the value of the idea at the official level, to twist it through the entire bureaucratic spiral, and then to introduce it. During this time the author may lose priority, while the development may lose applied value.

Henceforth the institute can apply directly to us. Our skilled consultants will confirm the promise of the development, then we will form a temporary creative collective, which is made up of specialists of the needed type and is headed by the author of the development, and will produce the apparatus. Here we retain the right to offer it to interested organizations in the republic and beyond it. In case of introduction the author of the development retains priority.

We have also been given the right to issue patents for inventions.

English Journal NATURE To Promote East Bloc Science

18140249 Moscow *KHIMIYA I ZHIZN* in Russian
No 4, Apr 89 p 25

[Article: "NATURE's East-West Exchange"; first paragraph is *KHIMIYA I ZHIZN* introduction]

[Text] At the beginning of this year John Maddoch, editor of the English journal *NATURE* (our journal wrote about it in No 8 of last year), visited the editorial office of *KHIMIYA I ZHIZN*. The guest told about the initiative of his publication, which is aimed at the improvement of contact between Soviet scientists and their foreign colleagues; he requested help in its implementation. Fulfilling his request, we are publishing an abridged translation of the announcement that was published in the first issue of *NATURE* for 1989.

The scientific community, it would seem, is capable of not that much: it can work and support honest work. Nevertheless, another thing is within our power—to promote favorable changes in the relations between East and West and to strengthen them. But this is not that little.

The enormous community of Soviet scientists would derive considerable benefit from closer contacts with the outside world. This would aid individual researchers in creative work, while laboratories and institutes would begin to work more productively, if their isolation were reduced if only in part. And there will scarcely be found in the West many skeptics who would not believe that the benefit from this would be mutual.

In recent times the leadership of the USSR and other countries has realized the urgency of such changes. The opportunities for trips of Soviet scientist to the West have increased unprecedentedly—just as they have for reciprocal trips of western researchers. The trend is obvious, all the same it is clear that such cooperation will not soon achieve the proper intensity and constructiveness without the assistance of the public.

That is the reason *NATURE* considers it necessary to take to practical steps for the promotion of this process.

First, we will do everything possible to draw attention to the most important directions of the research being conducted in the USSR—mainly to help our western readers.

Second, *NATURE* will set up an information network called "East-West Exchange," the goal of which is to establish contacts between professional researchers of both sides. The journal will play the role of only a mail box, relying entirely on the information reported by readers, as well as using its staff of consultants in order to find suitable partners in each specific case.

It would be ill-considered to conjecture in advance how successfully this arrangement will work, to start with it is sufficient merely to realize its potential importance.

For the reader wishing to participate in it, it is sufficient to report his name, address, and telephone or fax number in a letter addressed to the editorial office of *NATURE*. We give assurance: that this information will not be used for any outside purposes. One should also indicate, which one (ones) of the three possible forms of cooperation is desirable. The letter can contain:

- a request for information or assistance, which it is necessary to describe with the maximum specificity;
- data on the information or assistance, which is accessible through usual channels, but is hard to obtain in the East (in the West). It should also be described with all possible completeness;
- proposals on help in the retrieval of information or possible assistance in individual areas of research, which must be named with some precision (simply "high energy physics" or "molecular biology" can result in so many inquiries that the proposer will hardly be able to respond to them).

NATURE will publish reports on the development of the arrangement every 3 months.

The address of the editorial office is: 4 Little Essex Street, WC2R 3LF, London, Great Britain; the telephone number is (01) 836 66 44, the telex number is 262024.

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Summary Report of Ukrainian Academy of Sciences General Meeting
18140261 Kiev PRAVDA UKRAINY in Russian
2 Apr 89 p 3

[Article (RATAU): "Increase the Responsibility of Scientists for the Fate of Restructuring. The General Assembly of the Ukrainian SSR Academy of Sciences"]

[Text] No matter what sphere of social life we take, its rapid development is impossible without the fruitful influence of science. Precisely it is called upon to give answers to the key questions of the present and to offer developments that are capable of ensuring revolutionary socioeconomic changes in the country. This idea was decisive during the businesslike, exacting discussion of scientists of the republic, which took place on 31 March at the General Assembly of the Ukrainian Academy of Sciences. The basic results of the work of the Ukrainian SSR Academy of Sciences in 1988 and the tasks for 1989 were discussed at it.

President of the Ukrainian SSR Academy of Sciences Academician B.Ye. Paton, who delivered the report, noted that in conformity with the decisions of the 27th party congress, the 19th All-Union Party Conference, and the subsequent CPSU Central Committee Plenums the efforts of scientists were aimed at the intensification of restructuring in scientific work. The amount of basic and applied research increased, their financing grew as compared with the start of the five-year plan. In 1988 two scientific discoveries were registered. More than 2,900 inventor's certificates were received, which is nearly 22 percent more as compared with 1986. The number of inventions, which were used in developments that were introduced last year, increased by more than a third. The direct ties of institutes with foreign partners were expanded substantially. In all 40 license agreements and contracts were signed and 101 patent certificates were received.

In describing the research work of collectives of academic institutions, the speaker said that the past year was marked by a number of important scientific results which correspond to the world level. Among them he especially singled out an original system of the conversion of solar energy into electric power with a greater efficiency, which was developed on the basis of studies of the spectral splitting of concentrated flows of solar radiation, and the discovery of the phenomenon of the selective heterocoagulation of mineral colloidal particles by microorganisms, which significantly broadened the knowledge of the nature and mechanisms of the interaction of the living cell with metals. The discovery in the field of physiology, which substantially changes the notion of the mechanism of the permeability of skin, was a major gain. It makes it possible to develop fundamentally new methods of the prevention and treatment of diseases and to optimize the modes of operation at harmful works. The discovery of the phenomenon of the two-parent inheritance of the genetic determinants of

cytoplasm in case of somatic hybridization was a significant contribution to the development of cell engineering and the genetics and selection of plants.

The contribution of the academy to the technological modernization of sectors of the national economy increased. In particular, a plasma-detonation technology of surface heat treatment to improve the hardness of items of any shape, which does not have analogs, was proposed. The technology and equipment for the deep treatment of iron-carbon alloys with high-temperature gaseous reagents are distinguished by high resource- and energy-saving characteristics. The methods and programs of the analysis of the dynamic loads of high-power gas-turbine installations made it possible to substantially improve their parameters and increase their reliability. A line for the application of a protective polymer coating to the cylinder liners of internal combustion engines was introduced with a large impact.

In the report it was noted that the substantial reserve, which was created last year, of basic results and important technological developments, which substantially increased the potential of the academy, testifies to definite qualitative changes in the work on restructuring. During a visit to the Institute of Problems of Material Science M.S. Gorbachev gave a high rating to the work of scientists. But this does not give grounds for complacency.

The potentials of scientific collectives were used far from completely. This concerns both long known, but still unsolved problems and new problems that have arisen in recent times. They exist in the organization of scientific research and in the practical use of the obtained results, in the activity of cost accounting organizations of the Ukrainian SSR Academy of Sciences, personnel policy, and the development of the social sphere.

Scientists of the Ukrainian SSR Academy of Sciences, B.Ye. Paton said, have to overcome the serious lag in such basic directions as molecular biology, genetic engineering, biotechnology, selection, and genetics. Unfortunately, the majority of institutes of the biological type are adhering with incomprehensible obstinacy to traditional methods and are ignoring, in essence, the latest achievements in the indicated areas. The level of work on the development of advanced biotechnologies, which can turn into an even greater lag in this important area, is causing particular anxiety. It is impossible to further tolerate such a situation.

Touching on the tasks of social scientists, the president of the Ukrainian SSR Academy of Sciences directed particular attention to the necessity of a social orientation and practical aim of research and its subordination to the interests of restructuring. It is very important, he noted, to distinguish the aspiration for creative participation in it from its simulation and even its exploitation. Unfortunately, the actions of several groups, which are

aimed at the establishment of alternative political structures on a national basis in the form of various "fronts" and "movements," have become more frequent in recent times. The Presidium of the Ukrainian SSR Academy of Sciences expressed its attitude toward the draft of the program of the people's movement of the Ukraine for restructuring. The executives of institutions jointly with party organizations should intensify explanatory work, actively participate in the extensive discussion of urgent problems, and resolutely rebuff the attempts of demagogues to use democratization for the disorganization of the work of labor collectives and the pushing through of narrow group interests.

The scientific principles of the development of power engineering in the Ukraine and the tasks of institutions of the Ukrainian SSR Academy of Sciences—such was the theme of the statement of Vice President of the Ukrainian SSR Academy of Sciences Academician V.I. Trefilov. Having noted the increasing role and importance of power engineering as the base of modern civilization, the speaker described in detail the difficulties, which the further development of this most important sector of the economy entails. The main one of them is the adverse ecological consequences of the increase of power capacities on the planet. In the statement an analysis of the key directions of the development of power engineering was given and evidence of the more cautious, weighed approach to the construction of nuclear power plants, which has been winning recognition in recent years, was cited. At the same time it was stressed: in the long-term future in many countries, including ours, there is thus far no alternative to the use of nuclear power. The problem consists in the vitally important necessity of increasing the safety of nuclear plants and their judicious location. Scientists of the Ukrainian SSR Academy of Sciences are also actively participating in the solution of these problems. In accordance with their suggestion and substantiation adjustments were made in the program of the development of power engineering in the republic: the number of power-generating units was significantly reduced. Versions of the strengthening of the protective shielding of reactors, their construction in hard rocks, and others are being studied.

The very best means now, the vice president of the Ukrainian SSR Academy of Sciences stressed, is an active resource-saving policy, the reorientation of the national economy toward the development of less power-consuming and more science-intensive industries, and the development and introduction of energy-saving technologies. Until the appearance of a new safe generation of reactors the formed development of gas power engineering is exceptionally promising.

Vice President of the Ukrainian SSR Academy of Sciences and Academician of the Ukrainian SSR Academy of Sciences V.P. Kukhar covered in his statement the scientific principles of the optimization of the interaction of society and nature in the Ukrainian SSR. In his

opinion, an active and constructive position of society in combination with ecologically safe, clean technology, high technological standards, and reliability, as well as the economic principles of the management of the relations of the production and natural environments should be at the basis of the approach of scientists to this question. In this connection the very concept of ecology requires reinterpretation: it is called upon to study the problems of the interrelations of society and nature.

Having dwelt next on the scientific concept of these interrelations, the speaker noted that the comprehensive and qualitative monitoring of the environment should be the basis for the entire system. In the interrelations of society and nature, he believes, a systems, integrated approach and the uniting of the efforts of scientists of practically all fields of knowledge are needed.

The ever increasing participation of the Academy of Sciences in the making of an ecological evaluation requires the formation of a group of skilled experts, which is capable of studying arising problems quickly and comprehensively. The elaboration of the scientific principles of the efficient use of nature by the development and introduction of resource-saving technologies, closed technological systems, and so on is being put in one of the first places. The speaker stressed: the most important aspect of the new ecological thinking is the preparation of specific proposals on the structural reorganization of the national economic complex of the republic on the basis of the achieved reduction of the share of high-waste and resource-consuming industries.

The development at the Ukrainian SSR Academy of Sciences of research on the problems of interethnic relations and international and patriotic education—such was the theme of the statement of Corresponding Member of the Ukrainian SSR Academy of Sciences I.F. Kuras, academician secretary of the History, Philosophy, and Law Department of the Ukrainian SSR Academy of Sciences. He noted as positive the fact that in the activity of the Social Sciences Section of the Ukrainian SSR Academy of Sciences the study of the problems of the national and the international as a whole was specified as one of the priority directions.

At the same time from the standpoint of the 19th party conference and the November (1988) and March (1989) CPSU Central Committee Plenums, the speaker stressed, it is clearly visible that the pace, scale, and quality of the performed work far from completely meet the requirements of the restructuring of interethnic relations. The need for scientific recommendations has increased significantly, while the number of developments and corresponding publications at the academy in recent times has decreased sharply. Moreover, after the serious criticism meant for social scientists individual ones of them and even entire subdivisions curtailed their work altogether, advancing here an argument that is quite strange for a scientist: "We will wait for the Central Committee Plenum." But why not the other way round?

The inertia of obsolete concepts, approaches, and assessments is also having an effect. In scientific elaborations the qualitative changes, which are constantly occurring in the sphere of national relations, are being analyzed without the necessary depth, the dynamics of the new restructuring processes is not being taken into account.

Among the priority scientific problems, which are facing institutions of the Ukrainian SSR Academy of Sciences, the speaker singled out, in particular, the correlation of the international and the national, the national and the nationalistic and the study of the causes of manifestations of the last one. In this connection he directed attention to the obvious preeminence of the national over the international in the draft of the program of the People's Movement of the Ukraine for Restructuring.

Taking into account the sharp increase of the urgency of the themes concerning the problems of interethnic relations and the obvious prospects of the further increase of public demands for the corresponding scientific research, I.F. Kuras spoke in favor of the formulation of the republic comprehensive program "Contemporary National Processes in the Ukraine" and the study of the question of establishing the corresponding republic scientific center and made a number of suggestions.

Academician of the Ukrainian SSR Academy of Sciences G.Kh. Matsuka, academician secretary of the Biochemistry, Physiology, and Theoretical Medicine Department of the Ukrainian SSR Academy of Sciences, devoted his statement to the development of modern biotechnology. The corresponding republic program, he said, encompasses both traditional biotechnology and genetic engineering biotechnology, at the basic of which is the transfer of the necessary genes to the cells of microorganisms.

In speaking about the most promising developments, the speaker noted the development of semiconductor-based biosensors, which make it possible to determine the quantities of various biologically active substances. A method of the 100-percent diagnosis of hereditary or viral diseases, including AIDS, was assimilated for the first time in Europe jointly with Italian specialists. Work on the transfer of genes, which protect the human body against atherosclerosis, was launched. Appreciable gains were made in the area of the cell engineering of plants. Scientists of the Ukrainian SSR Academy of Sciences are now also conducting biotechnological research in space.

And still in many matters we have fallen substantially behind the West, G.Kh. Matsuka acknowledged. It is necessary to train skilled specialists quickly not only at institutes of the Ukrainian SSR Academy of Sciences, but also in the system of the Commission for Questions of the Agroindustrial Complex, at sectorial scientific research institutes, and at experimental stations. The development of the practical use of the achievements of biotechnology in many respects would be advanced by the establishment of specialized laboratories.

Member of the Politburo and Secretary of the Ukrainian CP Central Committee Yu.N. Yelchenko stressed in his statement the exceptional responsibility of scientists of the republic for the results of their work during the period of the unprecedented concentration of restructuring processes. The main thing today, he said, and such is our position in the Central Committee, is for scientific collectives of the republic not to lose the correct political orientation, that is, the understanding of the leading role of science in restructuring, a role which ensures the primary thing—the prospect of our social development, while sensing at the same time responsibility for the solution of the urgent problems of scientific and technical progress.

Having noted next the universal recognition of the contribution of leading collectives of the Ukrainian Academy of Sciences to the advance of science and technology, the speaker said at the same time that there exists in this positive fact its own dialectical antithesis. Several managers of scientific collectives have become too accustomed to praises and take critical remarks quite oversensitively. At the same time the stagnation difficulties and "obstructions" did not pass over science, just as other social spheres. Many of them, unfortunately, have also not been overcome today. First of all, this applies to the thematic orientation of research. The strategy of priorities, which was proclaimed by the presidium, is being implemented extremely slowly at several institutions. At many institutes real changes in this respect have not occurred, just as the substantial regrouping of forces in the interests of the rapid development of the most promising directions has not occurred.

The reason lies first of all in the inadequate democratization of scientific life. But under such conditions in places the interests of science are receding, narrow group interests or else simply personal vanities are gaining the upper hand.

In the statement the state of affairs at the Ukrainian SSR Academy of Sciences in the work with personnel was analyzed and questions, which are connected with the intensification of the interaction of science and production, the search for advanced forms of their integration, the development of the key directions of research, the development and introduction of advanced technologies, the solution of ecological problems, and the accomplishment of the tasks posed by the March (1989) CPSU Central Committee Plenum, were posed.

The secretary of the Ukrainian CP Central Committee devoted considerable space to the role of the scientific intelligentsia in the modernization of the ideological sphere. In the social life of our republic, as in that of the entire country, he noted, complicated, contradictory processes are occurring. As never before, the social initiative of the masses is seething. The election campaign, which became an important stage in the achievement of the reform of the political system, clearly showed this. It is difficult to overestimate the experience

that has already been gained during it. We will also certainly draw from this the necessary conclusions. But it can already be seen today that given all the reversals in the election the political policy of the Communist Party of restructuring and its election platform received support.

The lawyers, sociologists, and philosophers of our academy are called upon to make their scientific contribution to the improvement of the election mechanism, to other key questions of the achievement of the reform of the political system, and to the cause of the formation of a legal state. A broad field of activity has been opened up for all the social sciences.

Today the tasks of not only analyzing and criticizing the negative trends, which are emerging during the social reorientation of economic activity, but also formulating constructive proposals face economics scholars. Particularly with respect to the mechanism of the interaction of various forms of property, the introduction of cost accounting, pricing, the structural reorganization of the economy, and the scientific support of economic reform as a whole.

The urgent questions of the history, theory, and practice of interethnic relations require in-depth and comprehensive study. At this time the efforts of scientists of the academy and higher educational institutions and representatives of creative unions should be united around the formulation of a broad comprehensive program of the development of the Ukrainian national culture. Among the most urgent problems of political and spiritual life are the reinterpretation of our historical experience and the elimination of the "blank spots" of history. This is a matter first of all of historical science and history scholars.

The ideological situation, it was said in the statement, is characterized today as a whole by significantly increased activity: pointed discussions and political dialogs are occurring, the comparison of positions is taking place. All these are normal phenomena under the conditions of restructuring. One should regard as abnormal the fact that the political positions of a number of scientists, especially young scientists, are not distinguished by ideological clarity, while in certain part they are even ideologically incorrect. This, in particular, appeared with respect to the well-known draft of the program of the NDU (People's Movement of the Ukraine for Restructuring) and to the "movement" itself.

Quite a number of well-known scientists of the academy have declared in principle their rejection of the ideological and theoretical platform of the draft. The Presidium of the Ukrainian SSR Academy of Sciences has taken a clear stand on this question. But it is impossible to regard such an attitude as common in the collectives of academic institutions. The reasons here, of course, are ambiguous. The main ones of them are the weakness of the ideological and theoretical training of a certain

portion of the scientists, as well as the passivity of a number of party organizations of academic institutions, which do not always react to the incorrect political positions of party members, which are incompatible with the CPSU By-Laws.

Some of the executives of scientific institutions and social science specialists have avoided the scientific analysis of the provisions of the draft of the program of the People's Movement of the Ukraine for Restructuring and have not been able to see behind the smoke screen of pseudorevolutionary phraseology who has actually begun to rally under the banners of the "movement." Our undisguised ideological adversaries from the so-called Ukrainian Helsinki Union and Ukrainian Democratic Union, which are hostile toward everything Soviet and toward socialism, are doing this.

Only the genuine militancy of party organizations and the increase of their authority will make it possible to improve the ideological and moral atmosphere in scientific collectives. Only the personal responsibility and fundamental position of each communist scientist can erect a barrier to negative processes and antirestructuring sentiments.

During the discussion that developed the questions connected with the organization and directions of research at the Ukrainian SSR Academy of Sciences were touched upon, the means of increasing its effectiveness were discussed, the problems requiring immediate solution were named, and the shortcomings in work were revealed. Vice Presidents of the Ukrainian SSR Academy of Sciences Academicians V.I. Skok, I.I. Lukinov, and V.I. Trefilov were criticized in this connection.

Much attention was devoted to the restructuring of academic science and to the democratization of scientific life. While analyzing these processes and noting the obvious changes for the better, the speakers at the same time indicated cases of the creation of obstacles. They spoke, in particular, about the fact that some executives had become very accustomed to general recognition of their successes and to eulogies. Any attempts to direct their attention to defects and to the necessity of improving the internal atmosphere in collectives and significantly increasing the effectiveness of research are often taken in a very oversensitive way.

The inadequate activity of the Presidium of the Ukrainian SSR Academy of Sciences in the accomplishment of gradual democratization, in the broadening of glasnost in work, and in the overcoming of bureaucratic distortions was noted. But bureaucracy today also holds firmly in its embrace academic structures—from the presidium to the scientific subdivisions at institutes. The reduction of the staff of the presidium is creaking along. The genuine initiative and independence of scientific institutions have not yet been aroused. At institutes they are timidly agreeing to the broadening of the rights of

departments, first of all in matters of material stimulation. The personnel of the management unit often become the sieve, in which useful solutions and important information are held back.

The shortcomings in work, Academicians P.G. Kostyuk and V.S. Mikhalevich, Academician of the Ukrainian SSR Academy of Sciences A.A. Dolinskiy, Corresponding Members of the Ukrainian SSR Academy of Sciences Ye.V. Lebedev and M.S. Soskin, and others emphasized, are having an especially adverse effect on financing and, consequently, on the strengthening of the research base and the development of basic research, applied development, and international scientific cooperation.

It was noted: it is necessary to restructure science with allowance made for the new conditions of management. On this level the practice of filling the orders of departments should be continued and the competitive selection of proposals and the evaluation of themes and programs should be expanded, which affords opportunities for the priority financing of the most promising, priority basic research.

In the opinion of the speaker and those who made statements, the participation of institutes of the academy in the formulation of basic research programs of the USSR Academy of Sciences is now most prestigious. Although works of 60 institutions have been included in them, the results here should be more significant, institutes need to display greater initiative and persistence. This also concerns the preparation of state scientific and technical programs, which is nearing completion. It is important not to let the moment pass and to establish close contacts with the corresponding expert councils and personnel of the USSR State Committee for Science and Technology. For the present the scientific councils of the academy are taking a passive stand in this matter. It is necessary once again to consider most seriously the question of their activity, since the recent reorganization did not yield the anticipated results. Apparently, the councils should be established for a limited period, on the basis of specific scientific programs, while granting the councils the right to the competitive selection of themes and the distribution of finances.

An exceptionally important role also belongs to the departments of sciences of the Ukrainian SSR Academy of Sciences. Such questions as the specification of the strategy of the development of scientific directions, the organization of competitions, evaluation, the operations of scientific councils, and the preparation of forecasts and programs connect up in them. The necessary rights and opportunities have been granted to them, but, unfortunately, many departments have not yet become aware of their new role. Such a situation requires resolute and immediate correction.

While discussing the responsibility of scientists for the acceleration of scientific and technical progress, the assembly participants named as an indispensable condition the increase of the contribution of science to the

solution of the most important national economic problems and its integration with production. It was noted that the approaches to the introduction of developments, which were elaborated by academic institutions in past years, are also topical today. Research in fields, which has a direct outlet to the acceleration of scientific and technical progress, requires more intensive development. First of all this is the development of new technologies of an industrial and agricultural orientation, microelectronics, machine building, and others. A well-founded stand of the academy with respect to the specific means of the restructuring of the management of the economy and social sphere of the republic on the basis of self-management and self-financing is very necessary.

Academicians of the Ukrainian SSR Academy of Sciences A.A. Sozinov and V.D. Pokhodenko, Corresponding Member of the Ukrainian SSR Academy of Sciences O.N. Romaniv, and others in their statements spoke about the tasks of scientific collectives, which follow from the decisions of the March (1989) CPSU Central Committee Plenum, and about the need to offer rural workers the latest developments and to help in the development of the social sphere in the countryside. A scientific reserve already exists here. Now it is a matter of its implementation. It is necessary to introduce more widely in practice the new strains of wheat and hybrids of corn and sugar beets, which have been developed by scientists of the Ukrainian SSR Academy of Sciences, as well as industrial technologies of their cultivation.

The statements of Academicians of the Ukrainian SSR Academy of Sciences A.Ya. Usikov and F.D. Ovcharenko, Corresponding Member of the Ukrainian SSR Academy of Sciences V.I. Starostenko, and others were imbued with the idea: outside healthy and satisfactory nature all our social goals are impracticable. Especially as, in spite of the steps being taken, the ecological situation in the republic remains extremely complicated. The solution lies in the resolute changeover to a new type of interrelations of society and nature. It was stressed: the multisectorial collective of scientists of the academy can and should formulate the strategy of nature protection work in the republic and the scientific principles of ecological thinking and planning. The thorough ecologization of all scientific and technical progress is being brought to the forefront.

The problems of the efficient use of nature, Doctor of Technical Sciences A.G. Shapar said, are posing the need for the preparation of a set of questions for consideration in the republic Council of Ministers. Urgent steps on the stabilization of the ecological situation, the scientific substantiation of the environmental monitoring system, the tightening up of the coordination of research, the organization of scientific councils for problems of the most important nonrenewable and unique resources, and the development of an automated system of observations of the key parameters of the environment are needed.

Many reproaches in the report and statements were addressed to social science collectives, the role of which in the process of the revolutionary modernization of society has increased exceedingly. It was stated, in particular, that social science scholars should approach in a more active and interested manner the study of the processes that are occurring and should have a positive influence on their development. For the present the initiative in the posing of a number of topical questions belongs not to scientists, as it should be, but to various informal organizations.

The need to approach more responsibly and creatively the choice of research themes, to determine the priorities skillfully, to concentrate forces on the key directions and problems of the development of society, and to subordinate scientific research to the interests of social practice was discussed in the statements of Academicians of the Ukrainian SSR Academy of Sciences L.N. Novichenko, N.G. Chumachenko, and Yu.N. Pakhomov and Corresponding Member of the Ukrainian SSR Academy of Sciences P.P. Tolochko.

Touching upon personnel policy, some of the speakers noted that thus far there have been no appreciable changes in this important sphere. Among doctors of sciences there are still not enough high-class specialists in priority directions. The organization of the practical study of young researchers at major scientific centers of the USSR and, in particular, foreign countries needs radical improvement. The election mechanism and the system of certification are producing many irregularities. The influx of talented young people into science is still slight. This is a key section of the work of the entire collective of the Ukrainian SSR Academy of Sciences.

In the decree adopted by the general assembly the tasks of scientific institutions of the Ukrainian SSR Academy of Sciences on the intensification of the restructuring of science, the development of research, and the increase of the contribution to the acceleration of scientific and technical progress were outlined.

In conclusion certificates and medals were presented to the winners of the prizes named after prominent scientists and the prizes of the Ukrainian SSR Academy of Sciences for students of higher educational institutions and young scientists for the best scientific studies.

Deputy Chairman of the Ukrainian SSR Council of Ministers V.G. Urchukin, Deputy Chairman of the Ukrainian SSR Council of Ministers and Chairman of the Ukrainian SSR State Planning Committee V.P. Fokin, executives of a number of union and republic ministries and departments, and responsible officials of the Ukrainian CP Central Committee and the Ukrainian SSR Council of Ministers took part in the work of the general assembly.

Statistics on Status, Achievements of Ukrainian Science

18140250 Kiev POD ZNAMENEM LENINIZMA in Russian No 5, May 89 pp 65-66

[Article under the rubric "16 April Is the Day of Soviet Science": "Toward a Qualitatively New Potential. Figures and Facts"; passages in boldface as published; first two paragraphs are POD ZNAMENEM LENINIZMA introduction]

[Text] The Day of Soviet Science is celebrated on the third Sunday of April. Precisely in April 1918, V.I. Lenin wrote "The Draft of a Plan of Scientific and Technical Work," in which he gave a broad program of activity for the Academy of Sciences and the scientific and technical forces of the country.

During the years of Soviet power in the USSR a significant scientific and technical potential has been created. Science in our country is playing an increasing role in the development of productive forces and the improvement of social relations. "The policy of the party in the area of science," it is stated in the CPSU Program, "is aimed at the creation of favorable conditions for the dynamic progress of all fields of knowledge and the concentration of personnel and material and financial resources in the most promising directions, which are called upon to speed up the achievement of the outlined economic and social goals and the spiritual development of society and to ensure the reliable defensive capability of the country."

Revolutionary restructuring, which is now taking place in the Soviet Union, is impossible without the utmost stimulation of the intellectual potential and the progress of science and technology and without the increase of the scientific and technical contribution of scientists and engineering personnel.

The achievements of Soviet scientists are indisputable. However, the times are posing new tasks for science. As was noted at the 19th All-Union CPSU Conference, in recent years in the development of science and technology positive changes have appeared, the demandingness on the technical level of products has increased, and the time of the assimilation of developments of scientific research organizations has been shortened. Steps have been taken on the change of the system of the planning, financing, and material supply of research and development, on the rapid use of scientific achievements in practice, and on the stimulation of scientific labor. These steps had their own positive impact, but thus far it has not been possible to change the situation radically.

It proved to be especially difficult in basic research, which determines the prospects of science and scientific and technical progress. It is abnormal that the academic sector of science, which performs the bulk of basic research, accounts for only 6.8 percent of all the assets being allocated for scientific research.

The party posed the task to create a qualitatively new domestic scientific potential, without which it is impossible in a short time to achieve breakthroughs in basic research and on this basis to implement successfully the entire set of outlined programs of the socioeconomic restructuring of our society.

Under the conditions of restructuring the urgent social need for social science research and the requirement of the real advancement of the social sciences on a Marxist-Leninist philosophical and methodological basis arose. Objective scientific studies of such problems of restructuring as economic reform, the restructuring of the political system, democratization, humanistic modernization, international relations, new political thinking, and many others are necessary.

Society, which is heading toward its qualitatively new state, needs an integral concept of development, a vision of the dialectics of processes, and the elaboration of scientifically substantiated prospects.

In 1988 in the USSR, about 4 billion rubles were saved by the introduction of achievements of science and technology in industry.

The spending on science from the state budget and from the assets of ministries, associations, and enterprises increased as compared with 1987 by nearly 7 percent.

In the state registers 14 scientific discoveries in the area of nuclear physics, medicine, biology, physical chemistry and electronics, geology, and geochemistry and 84,000 inventions were recorded.

The automatic launching of the Buran orbital shuttle was accomplished. The first test flights of the AN-225 Mriya cargo aircraft, which is the largest in the world and is capable of taking aboard 250 tons of cargo, were conducted. The sea trials of the atomic lighter carrier Sevморпут were completed.

More than 2,500 models of machines, equipment, apparatus, instruments, and automation equipment were developed. The production of about 4,000 new types of industrial items was assimilated. The updating of products in the machine building complex comes to 11.4 percent (with a plan of 9.2 percent). However, the technical level, reliability, and competitive ability of the machine building items being assimilated continue to remain low.

The state order for the delivery of the most important types of new products was accomplished at the level of 83 percent, including on developments of interbranch scientific technical complexes (MNTK's)—91 percent, on state scientific and technical goal programs of an intersectorial nature—74 percent, and on the assignments of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries—89 percent.

In 1989, the budget allocations for the expansion of basic scientific research and intersectorial programs are increasing substantially. The financing of science has been specified in the amount of 21.5 billion rubles, or with an increase of 20 percent. Such promising research as the solution of the problems of high-temperature superconductivity and the development of new construction materials, biotechnology, and information science will be supported by means of assets of the budget. The role of the State Committee for Science and Technology in the coordination of the priority directions of scientific and technical progress is being increased. A special fund of financial resources will be at its disposal. The amounts of self-financing of sectorial science, which is changing over to cost accounting, are also increasing.

The spending on science from the state budget of our republic in 1988 as compared with 1987 increased by 18.7 percent. Two scientific discoveries were recorded in the state registers.

During the year more than 700 new models of machines, equipment, apparatus, and instruments were developed. The production of 1,042 new types of industrial items, including 730 descriptions in the machine building complex, was assimilated.

By means of the introduction of achievements of science and technology in industry of the republic 800 million rubles were saved.

The republic Academy of Sciences, which unites 80 scientific institutions, is the largest scientific center of the Ukraine. The pilot production base of the Ukrainian SSR Academy of Sciences to a certain extent is unique on the scale of the country. Here 11 pilot works, 30 experimental works, and 37 design and technological organizations are operating.

The efforts of scientists of the Ukrainian SSR are now aimed at the intensification of restructuring in scientific work and the increase of the effectiveness of research. Today the Ukrainian SSR Academy of Sciences is the leading center of the country in the area of material science, in a number of its most important directions leading positions in the world belong to it. There are also successes in other fields.

However, along with the achievements there are also unsolved problems, shortcomings, and oversights. First of all this concerns basic research. In a number of directions the Ukrainian SSR Academy of Sciences has lost the leading position. Meanwhile the academy, as its president, Academician B.Ye. Paton, believes, has every opportunity to make a worthy contribution to the development of a number of priority directions.

The firm establishment in scientific collectives of genuine competition on a healthy competitive basis, an atmosphere of the free exchange of opinions, creative

discussion, and an unbiased attitude toward new theories and hypotheses, the attraction of new talented people to science, and the improvement of the training of personnel of the highest skill should contribute to the stepping up of the activity of scientists.

In the USSR 22 interbranch scientific technical complexes have been established. Among them are two Ukrainian complexes—the Institut elektrosvarki imeni Ye.O. Patona Complex and the Poroshkovaya metallurgiya Complex.

In particular, the Poroshkovaya metallurgiya Interbranch Scientific Technical Complex gave a start in life to a large number of parts and entire assemblies of machines made of ceramics, to original heaters, and to unique medical instruments. Unfortunately, many of these innovations, which are attractive for the ease of production, still live "an exhibition life." Departmental barriers are interfering. Only the changeover of industrial enterprises to full cost accounting will force production workers to turn to face science.

Institutes of the Ukrainian SSR Academy of Sciences are fulfilling assignments of 106 union and 18 republic scientific and technical programs. With respect to three all-union and five republic programs the functions of head organizations have been assigned to them. The Ukrainian SSR Academy of Sciences was the initiator of the formulation of three all-union scientific and technical programs—on economical welded components in machine building and construction, on ceramic engines, and on the use of natural gas as a motor fuel.

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Report on Progress of Kazakh Academy of Sciences

Kazakh Academy General Assembly

18140257 Alma-Ata VESTNIK AKADEMII NAUK
KAZAKHSKOY SSR in Russian No 2, Feb 89 pp 3-5

[Article under the rubric: "The Session of the General Assembly of the Kazakh SSR Academy of Sciences": "At the Session of the General Assembly of the Kazakh SSR Academy of Sciences"]

[Excerpt] The session of the General Assembly of the Kazakh SSR Academy of Sciences was held on 23-24 November 1988. Secretary of the Kazakh CP Central Committee U.D. Dzhanibekov, Deputy Chairman of the Kazakh SSR Council of Ministers Ye.M. Asanbayev, executives of ministries and departments, and representatives of party and public organizations took part in the work of the session.

The basic theme of the General Assembly is the tasks of the Kazakh SSR Academy of Sciences in light of the decisions of the 19th All-Union Party Conference. [passage omitted]

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Sultangazin Speech

18140257 Alma-Ata VESTNIK AKADEMII NAUK
KAZAKHSKOY SSR in Russian No 2, Feb 89 pp 6-22

[Speech by Academician of the Kazakh SSR Academy of Sciences U. M. Sultangazin, president of the Kazakh SSR Academy of Sciences, at the session of the General Assembly of the Kazakh SSR Academy of Sciences of 23-24 November 1988, under the rubric "The Session of the General Assembly of the Kazakh SSR Academy of Sciences"; "On the Tasks of the Kazakh SSR Academy of Sciences in Light of the Decisions of the 19th All-Union Party Conference"]

[Text] The General Assembly of the republic Academy of Sciences is taking place during a special period, when all the working people of the country have begun the implementation of the decisions and recommendations of the 19th All-Union Party Conference. Today at the session of the General Assembly it is necessary to formulate the strategic policy of the republic academy in the accomplishment of the tasks that follow from the decisions of the party conference.

General Socioeconomic Problems of the Republic

Scientific problems are always dictated by the vital necessity and the internal logic of the development of science itself. Therefore, in order to understand what urgent, long-range problems face us, it is necessary to look in a new way, from a modern point of view, at socioeconomic life and the present level of world science.

First of all let us dwell on the state of the economy of the republic. As is known, it is suffering from serious distortions. In Kazakhstan the share of the extractive industry and the sectors, which are connected with the primary processing of raw materials, is comparatively high. Several sectors of agriculture continue to be developed extensively.

Economic disorders also affected the social class structure of the republic. The small percentage of industrial enterprises, which are furnished with modern equipment and advanced technological processes, affected the qualitative composition of the working class. A typical peculiarity of the characteristic sectors of industry is their extensive development, that is, the discovery and development of small mineral deposits and the involvement of new areas for agricultural needs. In spite of a surplus

of manpower resources, especially in rural regions, manpower was enlisted from outside for work at newly opened enterprise. Thus, the opportunity to reinforce the ranks of the working class with people of the indigenous nationality was missed.

For many ministries the production indicators—the fulfillment of the plan—came to the forefront, while the solution of such vital social problems as the construction of housing, kindergartens, and cultural and educational institutions, was relegated to the background. This circumstance adversely affected the state of the social sphere.

Thus, all the contradictions and difficulties, which our republic is experiencing today, are closely interconnected. One follows from the other. The political, economic, national, and ecological contradictions, as well as the contradictions in the sociocultural sphere have been combined into a single tangle. And it is possible to undo it, having started with the analysis of the main, decisive thing—with the contradictions in the area of the economy.

The Tasks in the Area of Economic Reform

The economy of our country is now going through a period of rapid changes. Within the unified national economic complex new forms of the organization of production are emerging—these are the brigade contract and lease, cooperation and individual labor activity, cost accounting and self-financing, and others. Under these conditions the determination of the optimum proportions in the structure of the economy is especially urgent and priority directions of the research of economists. It is necessary to solve the problem of the harmonious development of the republic as a whole and the increase of its contribution to the all-union coffer. Therefore, a scientifically substantiated forecast of a balanced economy and the distribution of productive forces should be given in the immediate future.

Another important problem, which follows from the decisions of the 19th party conference, is the economic substantiation of the changeover of enterprises of the oblast and region to full cost accounting. Bold ideas and conclusions, which are based on an accurate economic calculation, are required here. In the accomplishment of this task the Institute of Economics is the head institute.

The tasks of the scientific support of economic reform also require the elaboration of such fundamental political economic problems of socialism as the problem of ownership and the contradictions in production relations.

We need to increase the effectiveness of coordinating work. The regrouping of scientific forces at the Institute of Economics and in the Council for the Study of Productive Forces, the change of the specialization of departments, and the revision of themes with allowance

made for the requirements of the present period should be carried out. Several departments of the Institute of Economics with respect to the themes being studied correspond more to the structure of the Council for the Study of Productive Forces: for example, the departments of the territorial organization of production, the problems of population, and manpower resources.

The Tasks in the Area of Political Reform

As a result of certain distortions in the country the political system of socialism has undergone substantial deformation, which has affected the activity of the party, the Soviet state, and public organizations. As a result, in a number of cases the gains of socialism have developed into formal, unviable institutions. It is not by chance, therefore, that the questions of human rights, democracy, the system of Soviets of People's Deputies, the election system, demonstrations, the political and legal status of nations, the constitutional protection of public opinion, and others are particularly urgent.

The radical changes that are occurring in the economy and the sharp increase of the level of social consciousness and social activity are already making appreciable changes in the political system of society. Our social scientists need to study the dialectics of the development of man under the conditions of restructuring and his world outlook and psychology.

Great tasks face the recently established Center of Sociological Research. The study of public opinion on various aspects of restructuring and the trends of development of social consciousness should give a clear idea of the processes that are occurring in the spiritual sphere of life of Kazakhstan. Particular attention should be directed to the social class structure of the republic. The conclusions with respect to this problem are especially important for the making of correct political decisions and decisions in the area of sociocultural development.

The Tasks in the Area of Legal Reform

At the 19th party conference much attention was directed to the questions of the legal state and legal reform. Today a special report will be devoted to these questions. Therefore, I will not dwell on them in detail.

I would like merely to stress the following: our lawyers need to specify their own aspect of research and their own problems, which are connected with the peculiarities of the union republic. The establishment of the concept of the development of legislation of the Kazakh SSR in connection with the occurring changes in the political, economic, and social spheres seems fruitful. The problem of national statehood is, undoubtedly, the second important direction of juridical science. Until recently it was examined primarily on the historical level. But the time for the in-depth study of the current problems of nation state development has come.

In the last 1-2 years we have been witnesses to the aggravation of interethnic conflicts. There are many reasons for this—economic, ideological, and social. The time has come to shift from ostentatious slogans to the serious analysis of the factors that are giving rise to these conflicts. Scientifically substantiated conclusions on the objective laws of the development of national relations and their real state are needed. It is time, finally, to understand that internationalism signifies not the merging of nations, but, on the contrary, their development everywhere in cooperation. The progress of mankind and its unity in the historically necessary diversity are possible only on this condition.

Philosophers, historians, linguists, and literary scholars should give an answer to such problems, which are basic in their own way, in the area of national relations. Today one has to admit that the emerging contradictions and negative trends in national relations have not found reflection in numerous publications. Such irresponsibility is very costly. Bitter experience requires the maximum responsibility and efficiency and genuine objectivity when elaborating national problems. However, the initiative of scientists for the present is inadequate.

Let us take, for example, the problem of bilingualism in the republic or the problem of the social functions of the Kazakh language. For it is no secret that many people, including scientists, were certain that this language would not develop beyond the everyday sphere, in the area of belles lettres, and there was not need for this. Hence, too, the nihilism toward the Kazakh language on the part of the population, including its Kazakh portion. So far these incorrect notions have not yet been completely dispelled. The well-known decrees of the Kazakh CP Central Committee and the republic Council of Ministers are playing a positive role in the solution of the problems of bilingualism.

National relations are a lively developing and changing process. Therefore, without having understood the sources, it is difficult to explain what is happening today. It is even more difficult to foresee what there will be tomorrow. In this connection particular responsibility falls to historians. It is necessary to state frankly that historians did not always have sufficient civic courage in the coverage of some aspects or others of the historical process. Inertia has not yet been completely overcome. This is especially characteristic of research, which encompasses the postrevolutionary period and remote history. As a result, historians let priorities in many directions slip by. It is strange that with respect to the problems of the nomadic way of life in the United States and France more problems have been elaborated than here, although the territory of Kazakhstan was the cradle of nomadism. How was the transition from a nomadic economy to a settled economy achieved; what are the peculiarities of the industrialization of Kazakhstan; what kind of development did culture undergo? The elucidation of these questions will enable us to see both the

positive results of progressive transformations and the negative, at times tragic consequences of all kinds of excesses and distortions, which were concealed by pseudorevolutionary slogans.

Taking into account the urgency of the problems of national issues, the Presidium established the Center for National Relations. Its basic task is the analysis of present-day ethnic processes. It is oriented toward the elaboration of specific steps on overcoming interethnic conflicts. The center has to launch research of a leading nature.

Social scientists are faced with important tasks, for the successful accomplishment of which the restructuring of scientific organizational activity is necessary. With a staff of about 100 people each institute has 10-12 scientific subdivisions. The analysis shows that such a subdivided structure is not entirely justified. The fact that each department has its own scientific direction is not conducive to the concentration of the institute on one or two major directions and disperses scientific forces among minor, secondary themes.

In recent times we have often heard that the institutions of the Social Sciences Department are small, while their material base is weak. The same thing also applies to the question of the training of specialists in such scarce specialties as ethnography, sociology, psychology, Turkic studies, oriental languages, and others. The director of the institute and the academician secretary of the department confined their activity to information about the formed situation, without displaying personal initiative in overcoming these shortcomings. Specific steps on strengthening the material base of the institutes of the Social Sciences Department are now being taken.

The Development of Priority Directions

It is natural that the implementation of the general party policy of the acceleration of the socioeconomic development of the country is impossible without the leading growth of the basic sciences and the increase of the effectiveness of applied research. Of course, the Academy of Sciences is not capable of encompassing the entire range of scientific directions and problems, and here it is necessary to find the optimum combination, which, on the one hand, would ensure the rapid development of science itself and, on the other, would make it possible to put the available scientific potential to use as much as possible for the needs of the economy of the republic. Starting from this position we specified the priority basic and applied directions, on the basis of which the formulation of the concept of the development of the Academy of Sciences is now being completed. In essence, many provisions of it were formulated back in April of this year at the session of the General Assembly of the academy. During the past period it has been substantially enriched and has been supplemented with new tasks, which were posed by the All-Union Party Conference.

The established specific nature of the formation of the sectors of the national economy and the logic of the development of science itself determined the specialization of basic and applied research and the existing network of scientific institutions of our academy. The most manpower and material resources have traditionally be concentrated on developments which are connected with the study of the laws of the formation of the earth's crust and the distribution of minerals, their extraction and processing—these are geology, mining, metallurgy, and the complete use of mineral raw materials. In essence, the potential of three departments is concentrated on research in this direction.

During the past period our work on computational and applied mathematics, radiation material science, molecular biology and biochemistry, the social sciences, and so on has won authority. In these fields we have gained much experience and have a substantial scientific reserve, the results of research are finding extensive application in practice. Henceforth the closest attention will also be devoted to these directions. What prospect do we see here?

In the field of *mathematics* these are the further development of the theoretical and applied problems of nonlinear transport theory, Lie algebras, the theory of differential equations, and spectral operators; the study of nonlinear Boltzmann equations on the basis of discrete models, and a number of other problems.

The further development of applied and computational mathematics and mathematical simulation, which in recent times has been proceeding rapidly, and, what is especially important, not only at the Institute of Mathematics and Mechanics, but also at other institutions of our academy, is anticipated. And still it is necessary to admit that the use of mathematical methods, including simulation, is making its way into life with much difficulty. While today it is difficult to imagine the development at a modern level of the natural and, to a considerable degree, the social sciences without mathematical experiments, models, and the methods of computational mathematics.

Recently an analysis of the use of computer hardware at our academy was made. Let us cite several results.

In 10 months of this year in their research the associates of the Institute of Economics turned to computer hardware for 1 hour, the Council for the Study of Productive Forces—27 hours, the Institute of Microbiology and Virology—10 hours, and the Astrophysical Institute—97 hours, and this is out of the 10,000 hours of operation of the computer hardware. Here, as they say, no comment is needed.

And I would like to raise another question here. Now during the quantitative analysis of complex problems, which affect various directions of science, unified mathematical models, which make it possible to study a

process in all its diversity, are being developed. Unfortunately, at our academy such research is just arising. In the future we plan to begin the development of more complex models for the study of ecological problems, the problems of the complete use of mineral raw material resources, and others.

It is appropriate to note that against the background of the extensive introduction of mathematical methods in various spheres of scientific activity the stand of several executives of scientific institutions, who are hindering the introduction of new methods of research where all the necessary prerequisites for this exist, seems strange to say the least.

While speaking about research in the field of *physics*, it should be noted that the work on nuclear physics, the ion implantation of semiconductors, and multiple processes in the interaction of hadrons and nuclei in the area of accelerators and cosmic rays, the physics of the ionosphere, the physics of the sun and bodies of the solar system, the mechanics of deformable solids, and so on will undergo further development.

We anticipate significant results from the priority directions, in which, in essence, the potential of all our departments will be put to use. First of all these are the problem of the complete use of natural resources and the problem of environmental protection, which is connected with it. Research in this direction is traditional for us, but it is now becoming clear that given the existing approach we will not solve these problems.

As a rule, the planning and development of new mineral deposits are carried out without the adequate scientific study of the entire set of socioeconomic, technological, and ecological problems, as a result of which deposits are being developed far from comprehensively and completely. The overwhelming majority of deposits are being worked for the extraction of one type of minerals. The selective processing of rich ores and individual types of raw materials is being carried out.

At petroleum deposits only 40-50 percent of the raw materials are being extracted by modern methods, while practically all the casing-head gas is burned in flares. In the coal industry in case of underground mining the losses come to 50-60 percent. The slags of current smelting at lead plants at times contain more useful components than in specially extracted ores. These are just a few facts, but from them it becomes clear what great responsibility rests on us when conducting research which is connected with the use of mineral raw materials.

The Assimilation of the Mineral Raw Material Base

As is known, the Institute of Geological Sciences imeni K.I. Saptayev, which has a quite powerful scientific potential, a significant portion of which is concentrated

on research in the area of metallogeny and the comprehensive study of the basic mining regions, is concerned with questions of the study of the laws of the distribution of minerals in the earth's crust of Kazakhstan. Today it is clear that the further expansion of the mineral raw material base of the republic will occur mainly due to the development of deposits which do not crop out to the day; therefore, our geologists are being ordered to strengthen the basis component of this work and to give a more precise forecast of the location of new mineral deposits and the expansion of existing ones.

In conformity with the demands of the times it is proposed to intensify research on the clarification of the laws of the distribution of petroleum and gas. Here a scientific reserve has already been created and a definite return exists. Regions, which are promising in this respect, have been identified in the Caspian Sea area and Southern Kazakhstan, while a petroleum show was discovered quite recently in East Kazakhstan Oblast in the region of Lake Zaysan.

In speaking about our tasks in the area of the study of the processes of the mining of minerals, we are proposing the further development of the research, which has already given a good account of itself, on geotechnology and the theoretical principles of the optimization and establishment of systems of the processing and re-extraction of ores. Considerable forces will be concentrated on the drawing up of new highly efficient flow charts of the mining of minerals on the basis of an advanced set of electric mining machines and a continuous technology of the underground mining of minerals.

As I have already said, the question of the development of waste-free and low-waste technologies is extremely urgent in the republic. Here there are a large number of works, which are being completed at a most modern level and which are being successfully used in practice not only in our country, but also abroad. Recently Candidate of Technical Sciences V.A. Kozlov and Doctor of Technical Sciences N.A. Baytenev, who are associates of the Institute of Metallurgy and Ore Dressing, were awarded the 1998 USSR State Prize for the development and introduction of resource-saving technological processes in the production of titanium and magnesium, which increase the extraction of valuable components from the raw material and decrease the harmful effect of waste products on the natural environment.

The republic Academy of Sciences can offer production a large number of flow charts for the processing of mineral raw materials and the waste products of mining. Unfortunately, many of these works have not been brought up to the stage of completion in connection with our lack of a pilot experimental base, as well as effective organizational forms of the connection of science with production.

The role of the institutes of the Central Kazakhstan Department in the solution of the complex problems of the use of mineral raw material resources is still weak.

In recent years the research in the area of the refining of petroleum, which the Institute of Petroleum and Natural Salts Chemistry is conducting, has been causing serious anxiety here. This direction is now extremely urgent. However, the moral and psychological climate, which has formed there, is having a most negative effect on the state of scientific development. The management of the institute and the party and trade union organizations need to take the most urgent steps for the normalization of the overall situation and the creation of the conditions for efficient scientific work.

The Food Program

Particular attention at the 19th All-Union Party Conference was devoted to the Food Program. This question was a topic of special consideration at the Kazakh CP Central Committee Plenum, which was held in November 1988. The fulfillment of the Food Program and the efficiency of the work of the agroindustrial complex are a matter of foremost importance. In spite of the measures being implemented, we have not achieved the planned levels, and this is mainly connected with the lack of new scientifically substantiated technologies and the extremely drawn out time of the introduction of the achievements of science in practice. In many respect the solution of these problems depends on an effective goal orientation and coordination in work.

It is natural that a large role and much responsibility in the solution of the indicated problems are being assigned to the republic Academy of Sciences. In this connection permit me to dwell briefly on the tasks facing us.

First of all, it is necessary jointly with interested organizations to ensure in the shortest time the implementation of already completed scientific developments. By this there is meant the production of Kazakhsil dry bacterial ferments for the preservation of fodders. Ferments are used for decreasing the losses of nutrients and improving the quality of fodders. The increase of the production volumes would make it possible to increase significantly the economic impact from the use of microbiological preservatives.

The solonetz lands of Kazakhstan occupy an area of 74.7 million hectares (75 percent of the solonetz lands of the USSR) and are a natural reserve for the expansion of the planted areas of the republic. In connection with this the Institute of Soil Science is carrying out the republic Solontsy Comprehensive Program, the implementation of which will make it possible to increase the production of commercial grain to 163,000 tons, feed grain to 174,000 tons, hay to 164,000 tons, and straw to 268 million tons. At present effective technologies of the

reclamation and assimilation of solonetz soils, which are being successfully introduced under the conditions of Northern and Central Kazakhstan, have been developed.

Reclamation and the efficient use of water resources are playing a substantial role in increasing the yield of agricultural crops. As is known, in our republic this question is of particular urgency, and here it is appropriate to mention the research being conducted by the Institute of Hydrogeology and Hydrophysics imeni U.M. Akhmedsafin, on the recommendations of which the scientifically substantiated irrigation and watering of territories by means of ground waters are already being carried out. And I would like to speak about another operation. The interdepartmental Republic Center for the Receiving and Processing of Space Information is now being organized. This center on the basis of the use of the scientific potential of academic science and modern equipment will work on the difficult tasks of the forecasting of the yield and the evaluation of the state of land reserves and a number of other tasks. On the other hand, we now need to expand research and to strengthen our positions with respect to such basic problems as cell biology, biotechnology, and others. However, here we need to put things in order—to eliminate the duplication of the work that is being performed at the institutes of botany, molecular biology, and biochemistry and the Main Botanical Garden; to develop research on the genetic engineering of animals.

The tasks, which face our academy in the area of the development of the priority direction "The Complete Use of Natural Resources," are closely related with the tasks of another important direction—"Ecology and Environmental Protection." If you compare the formed structure of the development of the sectors of the national economy of our republic with the process of the aggravation of the ecological situation in the region, it is possible to note their most direct interconnection and interdependence. To date such sectors of the national economy as the agroindustrial complex and the extractive and processing industries are playing a critical role in ecology. On the one hand, the unprecedented rate of development of these sectors made it possible to increase significantly the output of agricultural products and the production of ferrous and nonferrous metal ores, coal and petroleum, and gas, while, on the other, it turned out that these processes left their negative mark on the environment and led to the destabilization of the overall ecological situation in the republic. Today the man-made salt desert with an area of 2 million hectares in the Aral Sea area is already well known throughout the world. Several regions in the Caspian Sea area on the verge of an ecological crisis. The nearly universal contamination of usable water resources, as well as the air basins of large cities is being observed. More than 13,000 hectares are taken up by production waste. The question arises: What contribution can academic science make to the matter of improving the overall ecological situation and to the prediction of the subsequent development of the ecosystem?

It is necessary to say that we clearly understand all the complexity of the problems facing us. Therefore, we began by setting to work on the formation of a unified concept. In this program it is proposed, on the basis of the unity of goals, to combine the efforts of previously isolated scientific research. Here we were faced with the problem of information on ecology in different fields of knowledge. Hence the need for the establishment of a common data bank and knowledge bank.

As the experience gained both in our country and abroad shows, the quantitative analysis of such complex systems as the ecological system is possible by the methods of mathematical simulation. However, a complete set of data in all fields of science is needed for this. We are now beginning work in this direction.

At this stage the Academy of Sciences has to formulate and fulfill a unified program of scientific ecological research and to introduce its results in practice.

Machine Science, Instrument Making, Physical Technical Directions

As you know, the republic Academy of Sciences at one time missed opportunities in such urgent scientific directions as machine science, robotics, instrument making, and physical technical directions, as a consequence of which they did not undergo proper development.

Therefore, now we regard as one of the priority tasks the conducting of research in the area of machine science—this is the analysis and synthesis of mechanisms of high classes and the theory of the development of robots and manipulators with endless kinematic chains. We have now been able to concentrate a quite significant scientific potential at the academy and are counting on a real return in the immediate future.

The second of the new directions—the physical technical direction—matured over a large number of years within our academy. The research in the area of material science, the development of new machines, and instrument making has already made it possible to obtain a large number of interesting scientific and practical results. Now our task is to make up more quickly for lost time and to provide intensively developing sectors of the republic with the necessary scientific analyses.

The Financial Support of Scientific Research

As you know, starting in 1989 a new procedure of financing scientific research work, which should bar formalism and eliminate nonurgent development, is being introduced. What is the essence of the new system of financing? Its most important distinctive feature is the financing not of institutes and laboratories, but the allocation of assets for scientific problems and themes. Here the amounts of research on themes of different levels are regulated quite rigidly. Thus, economic contractual jobs should be a consequence and development

of basic research, exploratory operations should come to 30 percent of the budgetary amount of financing, regional operations should come to 20-25 percent; the themes of these developments will be specified by a special Council with the participation of the Council of Ministers, the State Planning Committee, and the Academy of Sciences of the Kazakh SSR. Moreover, there is the state order, which is issued in conformity with decrees of the CPSU Central Committee, the USSR Council of Ministers, and the USSR Academy of Sciences. It is interesting to note that exploratory themes, as well as themes along the lines of the USSR Academy of Sciences and on regional problems are approved on a competitive basis. According to the new system, in order to obtain financing in the same amount as in 1988, scientific institutions will have to demonstrate not in words, but in deed the urgency of the research being conducted. In short, by the forthcoming changeover they need once again to analyze the themes, to create guarantees for the provision of themselves with assets by means of economic contracts, and to participate in competitions for the state order.

On the New System of the Management of Science

For the purpose of improving the mechanism of the coordination and management of science a new structure of the staff of the Presidium of the Kazakh SSR Academy of Sciences was developed. It will make it possible to raise to a qualitatively new level the scientific organizational work in the area of coordination and planning and the introduction of the achievements of science in practice. For this purpose two characteristic Councils have been established. In contrast to the now existing departments of coordination and planning and of introduction the Councils, having within them highly skilled scientific personnel, will carry out scientific methods supervision on the questions in their charge and will coordinate research at the level of international and all-union intersectoral republic problems. The remaining questions are referred to the departments of sciences.

A scientific organizational department, which is subordinate to the chief scientific secretary of the Presidium, is being established for the improvement of scientific organizational activity, the development of promising forms of management, and the efficient work of the Kazakh SSR Academy of Sciences.

Inasmuch as the questions of the provision of scientific research with highly skilled scientific personnel encompass both the selection of personnel and their training through graduate studies and doctoral studies, in the new structure the Department of Scientific Personnel has been formed on the basis of the departments of the selection of scientific personnel and graduate studies.

The establishment of a unified cost accounting organization, which will carry out the material and technical supply of scientific research in a continuous process—

from the acceptance of orders to the receipt of products—is being proposed. It is being formed by the merging of the department of physical assets and Kazakademsrab, here the department of physical assets is being removed from the structure of the staff of the Presidium.

In addition to the listed subdivisions there will be included in the structure of the staff of the Presidium: the secretariat of the Presidium; the planning and finance department; the foreign relations department, the first and second departments; the department of labor safety procedures, labor safety practices, and fire-fighting measures; the capital construction department; the administration of affairs; the administration of administrative and residential buildings; the medical and sanatorium department; the department of the use of equipment and metrological service.

For the strengthening of the staff of the Presidium we are now actively performing work on the attraction here of active, creatively thinking specialists.

Personnel Supply

The next important problem, on the solution of which the further development and the level of scientific research depend, is the selection and placement of personnel at all levels of academic science. We are now attaching particular importance to this direction in work. First of all, we replaced to a significant extent the personnel of the Presidium of the Kazakh SSR Academy of Sciences and the executives of departments and institutes. At this session we will approve a number of directors, who were elected in accordance with the new democratic system, with allowance made for the opinion of the collective.

I should also speak specially about the 5-percent replacement of personnel. Not at all the institutes is proper attention being devoted to this question. In 1987 at all the institutions of the Kazakh SSR Academy of Sciences 1,120 people, or 12 percent of the total number, were hired, of them only about half are under the age of 30, while only 2 percent are young specialists proper. The results of an analysis show that at the Institute of Geography there is now not 1 candidate of sciences under the age of 33, at the Institute of Geological Sciences of the 89 young scientists only 2 are candidates of sciences. And such a picture is observed at nearly all our institutions; only the Institute of Mathematics and Mechanics, where of the 72 young scientists 21 are candidates of sciences, is, I dare say, an exception, 3 doctors of sciences under the age of 40 also work here.

The cited data show that the executives of scientific institutions are still not devoting proper attention to work with young people. It is already time for us to shift from words to deed. We will hold the executives of scientific institutions most strictly responsible for the state of this work.

Such forms as the sending for practical studies and assignment to leading scientific institutions of the country should play a large role in the training of skilled personnel. This year we assigned about 30 people, many of those who performed practical studies returned to the academy. Our task is to create for them the necessary conditions for work. The time has come to raise the question of assigning our scientists for practical studies to leading world centers. However, given the existing system it is now difficult to do this. But, nevertheless, we plan to develop this work and see definite prospects along the lines of bilateral cooperation.

The fact that at the academy the average age of its members is increasing with time has already been repeatedly noted. The following regularity is being traced: the older the academy of sciences is, the higher the age of its members is. Thus, the average age of members of our academy in 1969 came to 57.3, in 1970—63.6, and in 1980—64.1. Today the average age of academicians is 67.3, while that of corresponding members is 64.7. Now, when new vacancies open with the attainment by academicians of the age of 75, the opportunity has appeared for the attraction of more young people as members of the academy. For the title of a member of the academy is not only an honorable, but also an obliging one, which makes it possible to work more actively for the development of science and the practical use of its achievements. It is necessary to take this into account and to take every step in order to reinforce the academy with active young forces.

The age of the doctors of sciences, who work at the academy, is also too high. Their average age is equal to 56.7. The share of doctors of sciences under the age of 40 comes to only a little more than 1 percent, the share of candidates of sciences under the age of 30 comes to 8.7 percent. At the institutes of mining, soil science, zoology, physiology, literature and art, and linguistics the average age of candidates of sciences exceeds 50; at the institutes of geological sciences, hydrogeology and hydrophysics, mining, soil science, microbiology and virology, literature and art, and linguistics the average age of doctors of sciences comes to 60 and more.

We made the decision in 1989 to open graduate studies at 7 of our institutes in 13 specialties. This question is now under consideration at the USSR Academy of Sciences. Moreover, we will continue to train doctors of sciences through graduate studies of leading centers of the country. In 1989 by special appointment we are assigning 21 associates.

In the achievement of the set goals the human factor is of particular importance. The efforts of scientific collectives should be focused on its maximum stimulation. The fates of scientific and technical progress in many respects depend on who will take and carry further the baton of scientific research. Therefore, the training of worthy scientific successors and the attraction to science of talented, obsessed young people are a task of great

state and political importance. One should resolutely clear the "obstructions," which are preventing the influx of talented young people, and get rid of the people, who by chance found themselves among scientific associates and have not displayed an aptitude and zeal for scientific work; one should carry out at a high fundamental level the certification and competitive hiring of personnel and evaluate the results of the activity of each of them according to their worth and in accordance with the highest standards of social justice.

The Supply of Scientific Instruments and Equipment

The analysis of the state of affairs in the area of automation, information science, and computerization shows that we are lagging, and significantly, behind the average statistical data of the country both in the level of developments and in the technical equipment of automated systems for scientific research. As a rule, systems of the automation of individual scientific experiments with their duplication even within a single institute are developed; third-generation automated systems for scientific research, that is, automated systems for scientific research at the level of local computer networks and multiprocessor and integrated systems, in practice are not being used.

As an example of developments at an advanced level it is possible to note the automated system for scientific research of the Institute of the Ionosphere, into the central computer of which data from the network of space and ground facilities, which are located both on the territory of Kazakhstan and in other regions of the country, will be fed and processed. The automated system for scientific research of the Institute of Geological Sciences imeni K.I. Saptayev, which is being developed at the level of a local computer network, which will make it possible to accomplish the complete automation of all the scientific research work of the institute, is also of interest.

With respect to the computerization of scientific research it is interesting to compare the following figures. It is well known that in order to maintain the constant increase of scientific knowledge, by 1990 it is necessary to have per scientific associate computer facilities with a capacity on the order of 1 million operations a second. But thus far per scientist we have up to 7,000 operations a second, that is, a thousandth as much. Although in 1988 the USSR Academy of Sciences allotted us the largest number of computers—46, as before there is an acute shortage of personal computers and minicomputers of the SM class, not more than 15-20 percent of the needs for which are being met, and mainly by means of expensive complexes.

The situation with the maintenance of computer hardware and scientific instruments is no better. The organization of the Kazakh Production Association for Computer Technology and Information Science of the USSR State Committee for Computer Technology and Information Science thus far has not improved the state of affairs.

Thus, in the indicated priority directions we need to:

- speed up the development and use of advanced intelligent automated systems for scientific research;
- envisage in the structure of institutes of the Kazakh SSR Academy of Sciences subdivisions of automated systems for scientific research for the accomplishment of a set of scientific and technical tasks on the automation of scientific research: from the development to the introduction and maintenance of automated systems for scientific research;
- use more extensively modern organizational structures: temporary creative collectives, engineering centers, and cooperatives;
- under the conditions of the broadening of the independence of enterprises, including the producer plants of computer hardware and scientific instruments, the institutions of the Kazakh SSR Academy of Sciences are to display more initiative in the establishment of direct contacts with the producers.

Database Organization and Support

At our academy for some reason it turned out that, when considering and determining the prospect of the development of science, there remained in the background such a most important question as the supply of scientific research with the necessary information. Therefore, it is natural that now this matter here is at an extremely low level. I recently acquainted myself with the subdivisions that are working in this direction: these are the Central Scientific Library and the Department of Scientific Information in the Social Sciences (ONION) attached to the Institute of History, Archeology, and Ethnography imeni Ch.Ch. Valikhanov. The people there are working with initiative and actively, but this work is of an uncoordinated nature. Unfortunately, here the latest achievements of science and means of automation and computerization are being used poorly. The material base of these subdivisions is in deplorable condition. Thus, at the library the question of facilities for the storage of books is extremely urgent, about 800,000 volumes lie in corridors and basement rooms, there are no means of mechanization.

The other day at a meeting of the Presidium the question of the work of our library was personally examined, a large number of measures on the improvement of its activity were outlined, and a library council of set up.

Supply With a Pilot Experimental Base

The unsatisfactory situation with experimental bases is the one of the most important causes of the lack and slow development of such promising directions as scientific instrument making, machine building, robotics, electronics, and the development of new technologies. This has been spoken about for many years, a number of

decrees of directive organs have been issued, the leadership of the Presidium of differing compositions with a trip to the sites familiarized itself with the state of affairs. However, nothing has changed. As before a significant amount of machine tool equipment of the pilot experimental metallurgical works of the Institute of Metallurgy and Ore Dressing, the shop of the pilot works of the Institute of Nuclear Physics, and experimental workshops of the Institute of High Energy Physics and the Institute of Mining is idle. On obsolete equipment with a term of use of more than 20 years under the conditions of an acute shortage of materials and the necessary personnel the production of even operating models of developed instruments, machines, and mechanisms, not to mention the production of prototypes with the corresponding technical specifications, without which their introduction is impossible, presents difficulties.

Recently at an expanded meeting of the Presidium with the participation of Chairman of the Republic Council of Ministers N.A. Nazabayev and executives of ministries and departments we set forth our concept of the development of the experimental base. The government supported us, and now we are beginning its implementation. Of what does it consist? If we really want to speed up the return of academic science to the national economy, we need first of all to establish scientific technical complexes with the minimal structure. These are the Kibernetika, Mashinostroyeniye, Fiziko-tekhnicheskiye problemy, Khimiko-metallurgicheskiye problemy, Biologicheskii tsentr, and Tsentr obshchestvennykh nauk Complexes. These complexes should include design bureaus, a pilot works, and an engineering center. In our opinion, this will make it possible to restore the missing link in the science-production chain. Of course, all this will be possible only in case of our active work, initiative, and persistence.

Introduction

The system of the organization of the introduction in production of completed scientific research, which exists at the Kazakh SSR Academy of Sciences, does not satisfy the demands of the 27th CPSU Congress and the 19th All-Union Party Conference. There are very few major and highly efficient developments that are being offered to the national economy. Thus, in 1987 of the 202 introduced developments only 70 yielded an economic impact, and then only 10 million rubles.

If we analyze the economic effectiveness of the work of our academy, it is possible to see that in 1985 it came to 56.5 million rubles and in 1986 to 14.2 million rubles, that is, a decrease of this indicator is being observed. However, we know that this is connected with the increase of the strictness of the rules of the accounting of the economic effectiveness and the abolition as of 1988 of form R-10. In connection with the changeover of enterprises to cost accounting and self-financing it will be extremely difficult to derive an economic impact, especially in the next few years.

So that the effectiveness of our work would increase, it is necessary to increase the demands on the choice of themes and the soundness of each study, to exclude random developments, as well themes that reflect only the personal interests of the scientists, and, on the other hand, to support such operations, in which the strategy of the development of the corresponding field of science is reflected and major regional problems are worked on.

A barrier should be erected to defects in the work of scientists who do not want to meet the present demands on the level of the work being performed by them. In this direction, in my opinion, the suggestion on using the experience of industrial enterprises that are operating on the conditions of state acceptance merits attention. Even the few works, which have been accepted for introduction in the sectors of the national economy, are being implemented with great difficulty, evoking reproaches on the part of managers of enterprises due to their own poor familiarity. The procedure of organizing work on the development and introduction in production of new equipment and technological processes, which have been developed by our institutes, as a rule, does not satisfy the requirements of the State Committee for Science and Technology, drags out the time of the settlement of questions, and leads to confusion. Therefore, the Council for the Introduction of the Results of Scientific Research jointly with the departments and the executives of institutes needs to develop a system of the organization of work on the practical implementation of the results of scientific research and to specify the level of responsibility for the fulfillment of specific stages in conformity with the requirements of the State Committee for Science and Technology (what the laboratory, institute, department, and Presidium are doing on introduction).

As experience shows, administrative pressure methods of introducing scientific research do not yield the desired results. With allowance made for the changed situation under the conditions of the effect of the Law on the Socialist Enterprise we need to seek new forms for the solution of this very difficult problem. Of great interest in light of what has been said is the work being performed on the establishment under the Presidium of the Kazakh SSR Academy of Sciences of the Ghylym Cooperative, one of the basic tasks of which is the organization of the introduction in the national economy of the country of scientific and technical developments of institutes of the Kazakh SSR Academy of Sciences, inventions, efficiency proposals, and the results of candidate and doctoral dissertations of associates of the academy, the production of nonstandard equipment and test runs or prototypes of new equipment, the performance of construction, installation, start-up, and adjustment work, and so on.

The newly formed Council for Introduction should take a most active part in the organization on the territory of the republic of scientific technical complexes, special design bureaus, engineering centers, and works on the

terms of cost accounting activity. Jointly with the Institute of Economics it is necessary to formulate the Statute on Introduction and methods of determining the economic effectiveness from the use of works in production. To study and to submit to the leadership of the Presidium the proposal on the material interest of the specialists who are engaged in the introduction of research (at institutes and in the staff of the Presidium).

The most significant highly efficient developments should be advertised extensively in the corresponding sectors of the national economy, for which it is necessary to organize the publication of "prospectuses," to use various conferences and exhibitions, and so forth.

The Development of New Forms of the Contact of Science With Production

We are now performing work on the search for the very best, mutually acceptable contacts of science with the sectors of the national economy. Interdepartmental scientific centers could play an important role in the integration of science and production. However, the establishment of such centers in the country is proceeding extremely slowly, while thus far in the republic they do not exist.

The Katalizator and Mekhanobr Interbranch Scientific Technical Complexes operate at the Kazakh SSR Academy of Sciences. The institutes of chemical sciences and metallurgy and ore dressing belong to the Avtogenyye protsessy All-Union Engineering and Technical Center and the results of such cooperation are already appreciable. The modernization of the Balkhash and Irtyshsk copper-smelting plants is already under way today on the basis of advanced technological processes. Prospects of introducing these processes in lead production are opening up. Other examples of the close cooperation of science, from which we expect a high return, also exist. Thus, the Institute of Molecular Biology and Biochemistry is the head organization of the Kazakhstan Biotechnological Center—1 of the 14 union centers, which were established for the rapid development and introduction of new methods of obtaining highly productive breeds of animals and strains of plants, biological preparations, and other means of the intensification of agricultural production. The Institute of Botany of the Kazakh SSR Academy of Sciences, a number of institutes of the Eastern Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, and the Kazakh State University imeni S.M. Kirov were also included in the center. However, thus far the head organization is not ensuring the necessary level of methods supervision of scientific work.

As experience shows, interbranch scientific technical complexes, as well as engineering and technical centers at the present stage are the very best forms of the organization of scientific research and the interaction of

science with production. They create favorable prerequisites for the intensification of scientific research, the sharp increase of the quantity and the raising of the quality of developments in the interests of the sectors of the national economy.

Temporary collectives are another organizational form of interaction in the conducting of scientific research and the introduction of its results in production. They have been formed and are operating at the Institute of Metallurgy and Ore Dressing, the Institute of Organic Synthesis and Coal Chemistry, the Institute of Chemical Sciences, and the Institute of Economics.

Temporary collectives can provide much assistance not only when the rapid technological implementation of a specific scientific achievement and an important invention is necessary, but also at the earlier stages of scientific research when implementing comprehensive programs, as well as for the extensive dissemination of methods of research and the substantial increase of the level of the automation of scientific research.

Coordination and Integration

The experience of the formulation and implementation of comprehensive programs, in which academic institutes are participating, shows that it is not always possible to completely ensure the orientation of all the performers toward the end results; the research on individual programs is performed in an uncoordinated manner, without the proper interaction among the coperformers. The quality of the formulation of programs needs improvement. The formed reserve, and not the urgency of the programs and the specific needs of the national economy, still has a large influence on the choice of goals. One can see this well from the example of the republic Intensification-90 Territorial Comprehensive Program, which was formulated by the Institute of Economics of the Kazakh SSR Academy of Sciences as the head organization. The program provides for the development of new types of machines, equipment, and instruments, new materials, and advanced technologies. The real reserves, the mobilization of which will make it possible to ensure by the end of the current 5-year period a stable average annual growth rate of labor productivity of up to 3.2 percent, were identified during its formulation. However, today the fulfillment of the program is slipping. Ministries and departments have relaxed the monitoring of the progress of the work, while here and there they have forgotten altogether about the existence of this program. The Academy of Sciences does not have the legal authority to carry out departmental monitoring and to eliminate arising difficulties.

The other republic comprehensive programs, on which institutions of the academy are working, thus far are also not fully justifying the hopes placed on them. Thus, the Institute of Organic Synthesis and Electrochemistry

imeni D.V. Sokolskiy did not ensure the proper coordination on the Corrosion Program; our institutes are not displaying particular activity in fulfilling the assignments attached to them on the Kirs Program.

Great tasks face science in the matter of the development and the coordination of research on nontraditional energy sources. Unfortunately, in the republic Geliobio-term Program the developments of our institutions hold a very modest place, although coordination was assigned to us. The overcoming of the existing shortcomings in this matter requires the improvement of the management of scientific and technical programs. It is now being carried out through scientific supervisors and coordinating councils and commissions, which operate on a voluntary basis. The establishment of specialized temporary organs of management seems advisable.

A few words about the work of scientific councils. Their coordinating role is very insignificant, but not only their lack of any rights, but also the stand of our scientific institutions and the chairmen of the councils are to blame for this. At one time they expressed the view that it is extremely difficult to organize the work of councils on a voluntary basis. We considered this question and in the new statute on the councils provided for the presence in them of exempt scientific secretaries. However, the work thus far is not making progress.

On the State of Social, Cultural, and Personal Service Facilities at the Kazakh SSR Academy of Sciences

To a significant extent the accomplishment of the tasks facing us depends on the state of social, cultural, and personal service facilities. A very difficult situation has formed here. The successes in this sphere are very modest. In the last 2-3 years in connection with the introduction of production facilities of the institutes of high energy physics, mathematics and mechanics, zoology, the ionosphere, and petroleum and natural salts chemistry, as well as after the capital repair of individual laboratories of the institutes of metallurgy and ore dressing, molecular biology and biochemistry, organic synthesis and electrochemistry, and the chemical sciences the working conditions and everyday production life of about 2,000 personnel of the Kazakh SSR Academy of Sciences were improved.

This year the construction of many planned facilities of a production, cultural, and personal service nature, which were envisaged by the decree of the Buro of the Kazakh CP Central Committee and the republic Council of Ministers of 2 June 1987, was disrupted through the fault of the Capital Construction Administration. Thus, for example, they did not begin the construction of production buildings of the institutes of experimental biology and molecular biology and biochemistry. Due to the low power of the boiler house in the settlement of Alatau in 1989, the further construction of housing for associates of the institutes of nuclear physics and high energy physics will be halted.

Due to the untimely assimilation by the Capital Construction Administration of the site for a nursery-kindergarten of the Academy of Sciences for 320 children, it was confiscated by the city soviet executive committee and transferred to another organization. At the same time more than 500 children are presently on the waiting list for the nursery-kindergarten.

Thus far a site in the city for the construction of a 200-bed hospital has not been specified, the designing of this facility is also lagging. The planning estimates for a number of projects being newly started have not been prepared for 1989.

Dormitories are in unsatisfactory condition. Thus, Dormitory No 2, which is intended for single specialists, special students, and graduate students and was occupied more than 2 years ago, was put into operation through the fault of the Capital Construction Administration with serious defects. The dormitories in the settlement of Alatau are unsafe. Dormitory No 1 is overcrowded contrary to public health norms.

At present 300 people are in line for a dormitory, of them 200 are in line for a family dormitory. The dormitory for 174 people under construction in the region of the pilot experimental base of the Chemical and Technological Sciences Department will not meet today's needs.

Such a state of social, cultural, and personal service facilities is adversely affecting the fulfillment of the demands of the republic CP Central Committee and Council of Ministers on the annual replacement with young personnel of not less than 5 percent of the total contingent of scientists and engineering and technical personnel of the Kazakh SSR Academy of Sciences. It is possible to say that with respect to these questions the work at the academy was performed extremely unsatisfactorily. Now we have completely replaced the management unit and hope that headway will be made.

In reforming and improving the style and methods of their work, our economic managers and the managers of planning and finance subdivisions in the immediate future should complete the drafting of the plan of the social development of the Academy of Sciences for the 12th and 13th Five-Year Plans and should strive persistently for its fulfillment with allowance made for the construction or renovation of such facilities as:

- a holiday hotel for 250 people on the shore of Lake Issyk-Kul;
- a Pioneer camp for 320 people (during the summer) with its use as a 2-day Holiday Home during the noncamping period;
- a sports hall at the academy campus of the biological type;

- a 150-seat dining room in the region of the main building of the academy.

In concluding my report, which, apparently, will be substantially supplemented during the discussion, I would like once again to emphasize that the substantial increase of the level and effectiveness of both basic and applied research is the ultimate goal of the commenced changes and restructuring in the activity of the scientific institutions, departments, and the Presidium of the Kazakh SSR Academy of Sciences. In this connection we should devote particular attention to the following three basic questions of the restructuring of academic science as a whole:

- the choice of the most urgent and promising directions of science and the highest concentration on them of scientific forces and fixed capital;
- the creation of the moral and material conditions for the rapid and wide-scale introduction of the achievements of academic science in production;
- the training and efficient use of highly skilled scientific personnel with the substantial reduction of their age and with the creation of the necessary conditions for the rapid advance of talented young people.

The carrying out of the thorough restructuring directly of the unit, in which science takes place, that is, at institutes and laboratories and in all research collectives, is now the most important task. Until we achieve effective restructuring on the basis of principled and well-meaning criticism, glasnost, and complete democracy, our science will not be able to develop quickly and effectively.

Restructuring begins precisely with the individual, with his initiative, and with his civic responsibility and activity; therefore, it requires the participation of every scientific and specialist in it. The 19th All-Union Party Conference is calling us to precisely such restructuring.

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Status of Kirghiz Academy of Sciences Discussed
18140253 Frunze SOVETSKAYA KIRGIZIYA in Russian 16 Apr 89 p 2

[Interview with Academician P.V. Zhivoglyadov, chief scientific secretary of the Presidium of the Kirghiz SSR Academy of Sciences, by SOVETSKAYA KIRGIZIYA correspondent E. Taranova under the rubric "Today Is the Day of Soviet Science": "The Right to the Truth"; date and place not given; first two paragraphs are SOVETSKAYA KIRGIZIYA introduction]

[Text] Fortunately, the times have receded into the past, when journalists marked every professional holiday with toasts to the representatives of one sector or another.

Now [these holidays] have become more a cause for an honest discussion about what it is necessary to do so that the field of human activity, which is being nationally commemorated, would carry weight in society and would contribute in every possible way to its progress. In this sense it is difficult to overestimate the role of science. Although the fact that not all of its reserves have been put to use also remains indisputable.

The interview of SOVETSKAYA KIRGIZIYA correspondent E. Taranova with Academician V.P. Zhivoglyadov, chief scientific secretary of the Presidium of the Kirghiz SSR Academy of Sciences, is about this.

SOVETSKAYA KIRGIZIYA: Have the modern methods of management, it seems, also affected the academic sphere?

P. V. Zhivoglyadov: Of course. The adoption of general principles of the restructuring of the management of the economy and the social sphere by the union republics on the basis of the broadening of their rights, self-government, and self-financing gave us a new stimulus. On the basis of extensive discussion at institutes we succeeded in formulating the concept of the development of the Kirghiz Academy to 1995. Among the main principles a broad orientation toward the solution of intrarepublic problems was adopted.

SOVETSKAYA KIRGIZIYA: In what areas of the national economy of Kirghizia is the immediate intervention of science required today?

P. V. Zhivoglyadov: This is, first of all, in the area of economics, the development of the mining complex of the republic, hydraulic power engineering, machine building, powder metallurgy, sheep breeding, and, finally, ecology. The scientific center for the problems of Lake Issyk-Kul is already at the stage of organization. Moreover, a temporary scientific collective for the comprehensive ecological and geochemical study of the state of the territory of the city of Frunze has been set up, the consequences of the industrial impact on the habitat of man are being studied. The point is that the state of the biosphere of the capital is causing anxiety. If it continues this way further, our house will become not very suitable for life. It is necessary to identify the basic sources of danger, which threaten the health of the city dwellers, and to elaborate recommendations on the elimination of pollution.

Just the first steps have been taken. But we hope that our research will influence more significantly the development of the economy of the republic.

SOVETSKAYA KIRGIZIYA: Literally, recently the academy, acquired some financial independence. Has it become easier to work?

P. V. Zhivoglyadov: As of 1 January of this year, we changed over to the new system and gave up the financing of institutes, having adopted the policy of allocating money for the fulfillment of specific scientific research projects, assignments, and themes. This process is occurring, of course, with difficulty. But there are grounds to expect that such a step will have an effect on the increase of the output of scientific collectives. This expectation is based on the already existing experience of working on economic contractual themes. Here complete freedom in the establishment of contacts with production workers, the filling of their orders, and the remuneration of labor in accordance with a fixed standard was granted. This did not fail to show up in the results—the total amount of work on orders within the republic and union enterprises increased in 1988 as compared with 1987 by 1.8-fold. At the same time the volume of the introduction of the results of scientific research work also increased. The economic impact last year exceeded 16 million rubles.

SOVETSKAYA KIRGIZIYA: Could the changes in working conditions, apparently, not but have affected the style of activity within the academy?

P. V. Zhivoglyadov: In recent times much has been done on the improvement of its structure and the democratization of management. The formation of the corps of directors of institutes and executives of large scientific subdivisions took place on a competitive basis. The just held election of academicians and corresponding members was an important aspect in the life of the academy.

SOVETSKAYA KIRGIZIYA: But there were also such elections before. By what was the present election distinguished?

P. V. Zhivoglyadov: By the scale and the broad range of candidates. Fortunately, a significant number of people were allowed to enter the competition, and more positions for election were made available. The aspiration to achieve some reduction of the age of the staff of the academy and its reinforcement with enterprises researchers appeared here.

SOVETSKAYA KIRGIZIYA: Although, in looking at the list of those elected, you would not say that young people became academicians and corresponding members....

P. V. Zhivoglyadov: All the same, the concepts young specialist, young scientist, and young academician are not the same thing. And I believe that the effect of the reduction of the age of the staff all the same exists. Moreover, the most different demands were made on candidates: not only from the standpoint of the scientific level and practical output, but also from the standpoint of scientific ethics and lofty human qualities. Under the

conditions of such a competitive struggle not everyone passed the test. In spite of the large number of candidates, vacancies were not filled in the specialties: botany, the history of Kirghizia.

Incidentally, the Academy of Sciences was long distinguished by democratic traditions. But it also has its specific nature. For example, the head of a laboratory is elected not by his associates, but by the scientific council, the director of an institute is also elected not by subordinates, but by scientists, who stand beside or over the person who is elected. An amendment, which makes it possible to take into account the opinion of the collective, was recently made. And all the same the question of whether it is possible to compare the election of, say, the leader of a construction brigade with the election of the head of a laboratory, in which at the same time he is also the leading performer of scientific work, remains debatable. This is approximately the same thing as if, being put to work on a new movie, the film crew by a vote nominated the director or an orchestra chose itself a conductor. In this case, it seems, the opposite is necessary, so that a researcher, who has shown himself to be a serious scientist, having gotten the go-ahead for the performance of work, would select for himself assistants, forming a creative collective for the implementation of his own idea.

When we talk about democratization, it should be emphasized that during a scientific discussion it is necessary to create such an atmosphere, when the same assertion, if it is correct, is correct both when made by a young specialist and when made by a professor. Not the title and official position, but evidence and scientific facts guarantee the right to the absolute truth in science. The intelligent word of everyone should be heard.

SOVETSKAYA KIRGIZIYA: But how is one to create such an atmosphere? It is no secret that for a long time it was different. At the Academy of Sciences the hierarchical pyramid was preserved very vigilantly. And at times young people, who were never listened to, had time to grow old in the position of junior scientific associates.

P. V. Zhivoglyadov: Well, first, a scientist of very advanced age may also remain young in spirit, but it happens that a young person also thinks in stereotypes, in a traditional and simply boring manner.

SOVETSKAYA KIRGIZIYA: And nevertheless young people for their most part bear the potential of modernization. How are they to occupy key positions a little more quickly, in order to actually influence the development of science?

P. V. Zhivoglyadov: Fundamental means for this exist. At each institute the opportunity to establish youth creative collectives has been afforded. Moreover, the Presidium of the Academy of Sciences is attempting to stimulate an interest in the formation of such temporary associations. Unfortunately, the right to free research for the present is not finding people who wish to exercise it.

SOVETSKAYA KIRGIZIYA: Hence, they are timid, and it is possible to understand this, for previously such opportunities did not exist. It is also necessary to get used to the right.

P. V. Zhivoglyadov: Yes, it is necessary to overcome this. I believe that a decisive role here belongs to the level of training of new scientific personnel, who would have both a thorough professional knowledge and lofty human qualities. We realize that in this area we have a serious lag. And now the first version of the program "The Personnel of Science," which is aimed at the training of enterprising people who take their own approaches to scientific problems, has been drafted at the Academy of Sciences. We want our young scientists to avail themselves of such opportunities as long-term practical studies, including at foreign scientific centers.

SOVETSKAYA KIRGIZIYA: Yes, we will hope that the implementation of such a program will not drag on for a long time.

Institute Director on State of Soviet Science
18140251a Moscow SOTSIALISTICHESKAYA
INDUSTRIYA in Russian 16 Apr 89 p 1

[Interview with Corresponding Member of the USSR Academy of Sciences Ye. Aleksandrov, deputy director of the State Optics Institute, by I. Mosin under the rubric "Today Is the Day of Soviet Science": "A Time of New Ideas"; date and place not given; first paragraph is SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] Today domestic science is going through a difficult time. In beginning restructuring, we assigned to it, figuratively speaking, the role of a locomotive, which should have pulled the national economy up to leading levels of world development. An entire package of decrees, which are aimed at the emancipation of the initiative of scientists and the quickest accomplishment of the posed task, was adopted. But time is passing, while results, to put it mildly, are sparse. In society the sense of anxiety and dissatisfaction is increasing. Where is science looking, where are the ideas of scientists, designs, and recommendations on the change of the present situation? Today Corresponding Member of the USSR Academy of Sciences Ye. Aleksandrov, deputy director of the State Optics Institute, reflects on these questions.

E. Aleksandrov: You know, in our social consciousness with respect to science there is a certain element of naive confidence that it is capable of creating miracles. But miracles do not happen. And it would be naive to expect of science the instantaneous solution of all the problems that have accumulated over the decades.

Moreover, I am convinced that until society has an internal need for the products of scientists, science will vegetate. And when will the need arise? When real competition among producers appears. Then they will be interested in the achievements of science—ideas, technologies, developments. But while the union of scarcity with monopolism remains, we will have to rely as before on the forcible introduction of scientific products.

However, it is impossible to reduce the troubles of science to the lack of receptivity of the economy. Of course, things are going very poorly with the implementation of achievements. And in the purely research area our positions were and remain as a whole anything but leading ones. There are enough objective reasons for this. The one named most often is poverty. We do not have enough assets, equipment, and materials. But what is most tragic, we also lag in the area of ideas.

SOTSIALISTICHESKAYA INDUSTRIYA: That is a somewhat unexpected change of theme. In the area of ideas we supposedly were always in the lead.

E. Aleksandrov: They always said that we were in the lead. But here is how we see ourselves on the world market. For achievements in the natural sciences during

the postwar period Soviet scientists have received 6 Nobel Prizes, while American scientists have received more than 60. Even with all the allowances for the bias of the Nobel Committee the comparison is a sad one. Especially if you consider that of the six Soviet prizes five were awarded for prewar works. It is possible to turn to another mirror—the index of the citation of articles. Here we also seem insignificant. The following data were published in the press: last year the journal *DOKLADY AN SSSR* in the number of citations was in...103rd place in the world, while *ZHURNAL EKSPERIMENTALNOY I TEORETICHESKOY FIZIKI* was in...117th place. But these are, after all, our leading journals.

With what is one to begin the advancement of science? We began with discussions on the lack of money. They say we are investing in science many fold less than the West is. But the money will sink in the sand, even if it is found and invested in the existing structures. That has already happened.

But there is a second problem—the personnel problem. Our system of education did not promote the cultivation and selection of the qualities of the independence and originality of thinking, which are most important for the scientist. Our school—from elementary school to the higher school—was oriented toward the production of uniform conformists.

It is now that we are saying that in school! it is necessary to learn to think and to learn to have one's own opinion. But we ourselves studied to the accompaniment of the motto "I am happy that I am a particle of this power." This system of instilling like-mindedness continued at the higher educational institution. I am certain that the time has come to revise radically the place and scope of ideological and philosophical disciplines in education. All the history of the 20th century proves the futility of the attempts of philosophy to control the development of specific sciences and at the same time demonstrates the power of ideologized philosophy in the suppression of sciences. It is necessary to leave philosophy to philosophers and not to stuff the head of a future electronics specialist with the details of the philosophical disputes of the last millennium. It is necessary to eliminate on the path to science the ideological filter, through which it is hard for creative people to pass, but which is open for time-servers and careerists. Science is highly littered with them, including the academy.

If we speak about the training of young scientists, one cannot avoid such a most important component, which is lacking in our country, as study abroad. It is being used extensively throughout the world. At one time this was our tradition, which was established by Peter the First. Prominent scientific leaders emerged from young scientists who did practical studies abroad. I will name in passing M.V. Lomonosov, A.F. Ioffe, P.L. Kadishcha, and R.V. Khokhlov.

Today about 30,000 Chinese are studying at American universities. At international conferences it is possible to encounter representatives of all countries, but, as a rule, not one Soviet young scientist. In our country a foreign business trip is regarded as the highest privilege, which it is necessary to earn. But it is too late for those who have earned it to study! Strictly speaking, this is already a related problem of direct international scientific contacts. The sharp—by hundreds of fold—increase of the number of trips of Soviet scientists aboard and of foreign scientists to our country is a most important condition of the activation of our science. Now there are practically no relations. Few people go, and these are mainly officials. Various departments are hindering departures. The situation with international conferences is deplorable: in the United States about 500 international conferences are held annually, in our country 10 are. But ideas originate through contact.

The matter of replacing scientific personnel is inevitably a long-term one. There are, however, burning problems which it is possible to solve quickly. First of all this is our, to use the expression of Shevardnadze, pathological secrecy. This is already being spoken about openly, and headway is being made. The appraisal of articles has been simplified. But here, too, very much has to be done. It is necessary to shorten the excessively swollen lists of themes, which require for publication permission in governing instances. As if there they understand the matter better than the authors! Educated by our austere system, we can but marvel how the West is putting in our hands the most important discoveries in laser technology, information science, and superconductivity, by publishing their results. The answer is simple—by classifying the West would undermine the dynamism of the development of its own science.

But what enormous both moral and material expenses this secrecy costs us. It removes from the zone of criticism collectives and entire institutions, often leading them to complete degradation. Receiving state budget assets almost unaccountably, they not only live parasitically themselves, but, by hiring contractors, expand the sphere of meaningless activity and create corporate networks. It is very difficult to fight against them even in the most flagrant cases. But incredible cases happen. I, for example, had occasion to review the report of a large collective, which for many years worked on developing an entirely secret engine for the achievement of speeds faster than light.

The training of new people, I will repeat, is a long-term matter. But it is possible to get rid of the harmful ballast quickly. I believe that now is a time of paradoxical solutions. The time has come to change the quality of our scientific personnel, without being afraid to reduce their number. Personal computers will not transform the listless and often cynical loafers at countless open and secret scientific research institutes. In my opinion, it is more profitable to send them off on a "pension" with the retention of pay than to allow them to "work," while squandering public assets.

SOTSIALISTICHESKAYA INDUSTRIYA: The groundlessness of our past claims to be in the lead along the entire front of science has now become obvious. How are we now to select priorities intelligently?

E. Aleksandrov: There are directions, in which we are bound to strive for the world level. It is necessary to develop solid-state physics in a priority manner—without this there is no microelectronics. Here the prospects are to a significant extent clear. The same goes for genetics and information science: no matter how we lag, it is necessary to try to keep up. But there are many directions, in which the West is exploring, while we have not yet proceeded to them. In many cases it is also not necessary—Why duplicate expensive efforts with unclear results? Science should break with motives of pure prestige—this is wasteful and humiliating. Another motive is the fear of being late in the discovery of a new destructive weapon—the atom bomb syndrome. I believe that precisely it is inciting us to ruinous competition with the West in the building of giant accelerators. In my opinion, it is time for us to switch from hopeless competition to cooperation. The price of discoveries in this area is excessively great, while for a long time now they have not influenced our life at all. And none of us will hide these discoveries, just as we have not hidden them up to now. We do not need to overtake the West in gravitation antennas—this matter is not urgent, it is possible to wait for the results. It is also not necessary to strive to be the first to step on Mars.

These opinions may seem to be primitive utilitarian ones. But what about one's own flight of spirit? This is a different theme. It is possible and necessary to try unbeaten paths, it is possible and necessary to conduct leading research, but on the condition that one's own idea exists and the price of its development is reasonable. It is necessary to subject ideas to democratic appraisal and to encourage them as far as possible.

SOTSIALISTICHESKAYA INDUSTRIYA: You are talking about internal changes in science. But what is one all the same to do with its output? Wait until a demand appears?

E. Aleksandrov: I believe that it is not worth waiting, it is necessary to actively prepare for this wave. No matter how we want to make production workers happy with supermodern technologies, love cannot be forced. This is a reality. I see a way out in work of our scientists for the western market. About 10 percent of our completed scientific and technical developments are still superior in their level. So let us sell them for currency and by means of them let us strengthen the material base of science. We have talented people. It is necessary to grant them the opportunity to earn currency for their ideas. Perhaps, to create joint ventures or laboratories and to conclude a contract for the fulfillment of a specific theme. And

perhaps, following the example of the Mikrokhirurgiya glaza Interbranch Scientific Technical Complex, to reach an agreement on the establishment of their own affiliates in various countries.

I already hear objections: How is that, will we sell brains, while we ourselves stagnate? But is it really better when our developments are simply sold or, having gotten in some way to the West, they then return to us in materialized form, but for hard currency? We should join as quickly and as intensively as possible the front line of the world scientific and technical front. I do not doubt that the experience, contacts, and money, which we will acquire as a result of such cooperation, will also greatly help us in solving internal problems.

Democratic Reaction in Academy of Sciences Described

18140254 Moscow SOVETSKAYA KULTURA in Russian 11 May 89 p 3

[Article by Doctor of Juridical Sciences B. Kurashvili, leading scientific associate of the Institute of State and Law of the USSR Academy of Sciences: "New Times at the Academy"; first paragraph is SOVETSKAYA KULTURA introduction]

[Text] The election at the Academy of Sciences showed that in the life of our scientific Olympus, a time of changes has come. What happened? What outlines of the future are coming into view?

The Factual Side

On 18 January 1989, the "expanded plenum" of the presidium of the academy nominated and submitted 23 people for registration as candidates for people's deputies for the 25 seats which had been allotted the academy.

A protest rally, at which nearly all the Moscow institutes of the academy were represented, gathered 2 weeks later at the building of the presidium of the academy. The scientists declared that they were not inclined to tolerate the defiance of their will.

It is necessary to say that by this moment the new leadership of the academy had done much to get the reputation of being bureaucratic. At that time, when in accordance with the new law the idea of the electivity of managers of enterprises had begun to be implemented, when the decisive powers of labor collectives had finally ceased to be surprising, the president and presidium held the view that the scientific institutions of the academy had failed to come up to such democracy. The scientific collective can, they said, nominate a candidate for director. But "to elect" is, excuse me, the prerogative of the department.

The election move of the presidium became a bucket of gasoline which was spilled on glowing coals. And—do you believe it—in the face of the crisis the academy

leaders sobered and began to perceive the situation in its unpleasant complexity. They understood that they might find themselves in the position of generals without troops.

The presidium in this situation acted wisely. They have already written quite a lot about this in the press. I will add only what seems important to me. Academician G.I. Marchuk met with Moscow electors and informed them about the forthcoming democratization of the internal life of the academy "in the broad sense of the word."

The results of the election showed that practically all those, on whom the "rank and file" electors insisted, were approved. From half to a third of the members of the academy supported them.

Such a thing had not yet happened in the history of the Academy of Sciences. It was a rebellion, although a civilized one. For the first time not only the privileged stratum—the members of the academy—made the decision. It seems that we have before us a turning point in the history of the academy, which has blended harmoniously with the process of overall restructuring.

A Little History

The present organization of the Academy of Sciences often seems not to have analogs and to be the only possible one. The academy reproduces itself and is reinforced by cooptation, that is, by the election of new members by itself. But how can it be otherwise? Not to grant anyone the right to appoint them. Are the scientific collectives to do the electing? There will be a scuffle, an orgy of claims. Nominate candidate members of the academy—by all means, but elect them—now, pardon me, only the academy can do that. So it was, so it will be.

Perhaps, so it will be. But in a different overall situation, in a different context.

If you consider the essence of our present academic organization, its medieval nature will appear. The academy was organized after the pattern of medieval craft and trade shops and guilds. However diverse the types of activity are in their content, their organization can be for the most part the same. The skilled craftsman and the apprentice, the merchant and the shop assistant, the academician and his assistant (adjunct)—all these in principle are the same organizational types. Shops with skilled craftsmen enjoying full rights and apprentices and pupils, who do not enjoy full rights or have no rights at all, are the most developed form of medieval democracy. Democracy is for the skilled craftsman: they elected the managers and introduced new members into their "family."

The heart of this form of democracy is cooptation and self-management. This is much better than appointment and management from above. That is also how scientists organized themselves at one time. In the organizational

sense the academy is the same shop, the same guild. The authorities, who for different reasons were interested in science, tolerated academic liberties and did not treat them roughly. The shop principle of organization is weighed down by conservatism, but at that time this was not disturbing. Stability was valued more than development.

The bourgeois revolutions, in firmly establishing competition, equality, and the acceleration of development, swept aside the craft shops and guilds, which were inclined to exclusiveness, monopolism, and stagnation. As for science, the academies were preserved. However, not they, but universities and firms became in the majority of countries the centers and organizers of research. In Russia, and then in the USSR development took a different path. The aggregate academician (the general assembly of the Academy of Sciences and the presidium) became the organizer of the research activity of the aggregate assistant (the system of scientific research institutes). Academicians and corresponding members work at the institutes, yet manage them not only by virtue of their positions at them, but mainly as members of the privileged stratum, clan, or club.

The composition of this management club in the past 2-3 decades has changed greatly. Members were elected to it not only and not even so much on account of scientific services and subject to personal scientific achievements as on account of their official position in science. Directors of institutes often become corresponding members and academicians. But not necessarily the most talented scientists become directors. The laws of the formation and self-support of the nomenclature operate here. Scientists of average level, who have organizing abilities, are oriented toward authority, and are in favor with the leaders, have advantages. They make up for the lack of scientific prestige with a position. And with an academic title. The devaluation of this title has become obvious. There are quite a number of "genuine" academicians, but their share is steadily decreasing.

In academic scientific collectives at least one-tenth of the scientific associates are indistinguishable in their scientific potentials from the current "average" academician. Many prominent scientists, who are employed in academic, VUZ [Higher Educational Institution], and sectorial science, do not get into the academy precisely due to the originality of thinking, the novelty of scientific results, and the independence of behavior. All this does not prevent many members of the academy from looking down on "various other" scientists and at the same time from "pressing themselves" as joint authors to their works. "In our science," Academician D.S. Likhachev shares his sad observation, "there have remained many individuals, whom both colleagues and students would esteem as spiritual fathers, against whom they would check their own actions as against a tuning fork."

The medieval form of organization of the Academy of Sciences, which has been enriched by bureaucratic practice, had the result that the academy became something

like a ministry of science. The presidium hands out positions and allocations. It gives orders and calls to account. The president and vice presidents ride in black dreadnoughts called Chaykas. The apparatus puts on airs and commands.

Everything is like that. But we will be fair. Under our concrete historical conditions with authoritarian regimes, which succeeded each other and passed themselves off as "democracy of a new, higher type"—under these conditions medieval academic democracy also was not superfluous. Moreover, it was vitally necessary for the preservation of if only the minimum freedom of scientific creativity. The academy frequently "refused to budge," preventing the desecration of science, not turning its members over to bureaucrats of exalted rank for tormenting, and sometimes also interceding for non-members. The associates of academic institutes are in a more favorable position for scientific creativity than their colleagues in other sectors of science. The "academic plebs" has something for which to feel gratitude toward its academy which "has turned into a ministry." No one is demanding a total breakup. But there is a most urgent need for thorough democratization.

Outlines of the Future

The essence of reorganization and the way out of the crisis consist in the change of the organizational paradigm and the basic organizational idea. In some way "the good old times" can be preserved. But just not in the organization of the management of science. Here it is necessary to abandon medieval democracy, which is based on cooptation and privileges. It is necessary to switch to modern democracy, which is based on electivity from below and equality. And in so doing to find an extramanagerial use for the traditional forms.

Such is the general line. There can be several specific versions of reorganization. I will venture to suggest one of them for discussion.

The Academy of Sciences and its presidium abandon the troublesome field of management, leaving in it only individual representatives of them. To the extent that it is necessary in general to manage scientific research institutions (the establishment of the general principles of their work, the organization of work on comprehensive programs, the distribution of allocations and assets, the maintenance of international relations), the Soviet academic association, of which all scientific associates of academic scientific institutions—from academicians to "people without a degree"—become equal members, deals with this.

The Academy of Sciences is retained as a consultative and, perhaps, elite organization, but elite only in the sense of "an aristocracy of the spirit." The feudal ranking of members of the academy is abolished, all of them, including corresponding members, are called academicians. It is also possible to talk about the number of

academicians. In my opinion, there should not be many of them, since it is a question of the spiritual elite, the best of the best. The rule that 1 new member is elected in place of 5-10 elected old members, is in effect until the achievement of the new number. Consequently, there are no purges. The existing procedure of reinforcing the academy is retained. In the end the academy is revived, is revaluated, and acquires a new quality—it becomes the highest expert and moral council, a scientific Areopagus that settles disputes, which includes world-famous scientists with irrefragable moral authority.

It can be assumed that, in addition to the academic association, analogous associations will emerge in VUZ and sectorial science. But there will be one essential difference between them. Whereas the academic association should be an equal, "sovereign," self-managing association, which independently settles its own affairs, the two other associations will sooner be "co-managing" public organizations, which share functions and powers with the corresponding organs of state management. These three associations could also be united into a union (or federation) of scientific personnel of the USSR.

Perhaps, my proposal will be questioned. However, many of us are convinced: new times should also come for our dear old academy.

Worldwide Competitiveness of Soviet Machinebuilding Discussed

18140230a Moscow NTR: PROBLEMY I RESHENIYA in Russian No 7 (94), 1989 p 3

[Interview by B. Polukhin with V.K. Faltsman, chief, sector on the economic problems of the material and technical base of socialism, USSR Academy of Sciences Institute of Economics, doctor of economic sciences: "The Fetters of Old Equipment"; passages in boldface as published]

[Text] In the middle of last year, the leaders of the machinebuilding complex reported in the press that one-half of the machines and equipment being produced in the country have already reached world standards, i.e., have become competitive. So then, how does one explain the fact that the share of machines and equipment in export transactions (according to data from the USSR Council of Ministers State Foreign Economic Commission) decreased to 11.7 percent in 1988, against 13.9 percent in 1985, with an overall drop in foreign trade turnover for a comparable period? Even export production is not distinguished by fundamental novelty and high quality. So, over the last 3 years, foreign companies have made more than 1 million claims due to the quality of equipment which was delivered.

At our correspondent's request, V.K. Faltsman, chief, Sector for Economic Problems of the Material and Technical Base of Socialism, USSR AS Institute of Economics, doctor of economic sciences, expresses his own view of this problem:

V. K. Faltsman: In evaluating the technical level of production, to put it frankly, the leaders of the machinebuilding complex were disoriented by a temporary standard method for evaluating the technical level of machinebuilding production, approved by the USSR GKNT in 1986. Considerable "discrepancies" exist between its criteria and the world standard requirements. This is easy to ascertain.

In order for the equipment to become competitive, it must be radically renovated. Presently, slightly more than 3,000 new models of machines, equipment and instruments are created annually in the sphere of NIOKR [scientific research and development work]. This makes it possible to renovate only one twenty-fifth of production. At this rate of renovation, it is simply unrealistic to make one-half of the series-produced items competitive in 2 years. In order to do this, a base for scientific research and development work would have to be created which, in terms of scientific and technical potential, would surpass the United States, Japan, and the FRG taken together. This would ruin us.

NTR: PROBLEMY I RESHENIYA: What part of machinebuilding production for 1987 really was competitive?

V. K. Faltsman: If the evaluation method first suggested by USSR Goskomstat Deputy Chairman I.A. Pogosov (the proportion of exportable production of a world technical level in the production volume for machines, equipment and instruments) is used to answer this, this indicator was equivalent to 16 percent for the machinebuilding ministries in 1988. However, in my opinion, this indirect evaluation is inflated and does not reflect the true state of affairs.

The situation in machinebuilding is such that the modernization of structures and industry will predominate for a long time, not the output of fundamentally new generations of equipment. Naturally, the first way of raising equipment quality is preferable, but the prerequisites for it have not yet been created. That is, in the initial stage of the reform one is more likely to see a lessening lag in the technical level of mass-application production, than the achievement of its competitiveness. Moreover, the situation cannot be altered by a "cavalry" attack.

After 3 years of work by the machinebuilders in the current 5-year period, we can only verify their extraordinary optimism in the development of plans—after all,

it was planned by the end of the 5-year period to bring the manufacture of basic production, conforming to a world level, up to 85 percent and, of newly-developed products—up to 100 percent.

A reasonable question: How come the new models of equipment do not meet the world standard? It is not just a relapse of the old machinebuilding "philosophy"—do not invent, just copy Western models—that is having its effect here. We must honestly admit that the policy of technical priorities is one of the worst bottlenecks in our economy. The creators of equipment either stay on the paths of old equipment, or increase the pace in a new direction without looking, only measuring fashion...

For example, the originally progressive tendency of raising the unit capacity of machines and facilities long ago ceased to meet consumers' requirements. The equipment's economy, maneuverability, and ergonomic and ecological qualities have taken first priority, not "horse-powers." The economic limit of expediency for increasing unit capacity has already been reached (its further growth no longer leads to reduced production losses) for several kinds of equipment, such as, for instance, blast cementation furnaces. However, many leading design bureaus, scientific research institutes, and plants have not at all recovered from gigantomania in producing machines, which also creates material prerequisites for monopolization.

An illustration of another extreme in technical policy is the priority of flexible automation in machinebuilding. Are the extraordinarily high paces of its implementation warranted? In the 11th 5-year period, outlays for creating and applying industrial robots, numeric control machine tools, and automated technological process control systems were commensurate with the total annual capital investments in machinebuilding and metalworking. However, the expected outcome for the country was not obtained. On the contrary, most of the flexible production systems studied in enterprises were unprofitable. In many cases, the data on their economic effects were based on figure-padding.

The point is that the results of flexible production automation depend on the possibilities for NIOKR, built into it by the designers, and for accelerating production renovation, not on how much was spent on it. When conditions were not ready for using the new equipment efficiently, a "sabre" success was pursued. Such conditions still need to be created: it is also necessary to further increase the reliability of industrial electronics and decrease its prices, to sharply raise the level of software, and to organize the company repair and maintenance of equipment.

What should the USSR Gosplan and the USSR Council of Ministers Buro on Machinebuilding take into consideration in forming the further strategy for developing the sector? Above all, in my opinion, the rational correlation between the two ways to increase equipment quality—by

creating fundamentally new generations of equipment, and by modernizing structures and industry—must be clearly determined for each stage of development.

In scientific and technical policy, we must not only define the directions and final goals of the technical retooling of the economy, but also develop plans, which must indicate guideline time periods for creating the organizational and technical prerequisites for this process, as well as paces and time periods for applying innovations in industry. We must coordinate renovation measures with work and with the development of the basic and auxiliary enterprises which participate in innovation.

It should be noted that an opportunity is opening up today for a rapid increase in the level of competitiveness of machinebuilding production—primarily, by converting the defense sectors.

Many Issues Debated at Nuclear Power Conference

18140230b Moscow NTR: PROBLEMY I RESHENIYA in Russian No 7 (94), 1989 pp 1, 7

[Article by V. Pokrovskiy: "Emotions Surrounding Nuclear Power Plants"; passage in boldface as published]

[Text] On 23 March, at the Palace of Culture of the Institute of Atomic Energy Imeni I.V. Kurchatov, the second conference of the nuclear power workers' discussion club was held. The first, held about 2 months ago, could hardly be called a discussion: the "greens" did not speak there, although they were invited, and specialists had to convince specialists that nuclear power is not really so bad in general, and that, mainly, we cannot do without it.

A dialogue was necessary. This dialogue, perhaps, occurred for the first time at the second conference. In the course of 5 hours, both "greens" and "reds" (the nuclear physicists call themselves this, apparently, because of the color of the "Danger—Radiation!" sign) of very different shades spoke.

The "bright red" director of one of the ASTs [nuclear heat supply plants] being built was there—every second, he shouted into the microphone about the need to rapidly pass measures against the "greens." There was a lady from the "bright greens," who started a discussion of the Crimean AES [nuclear power plant]. She made many passionate accusations, but was not listened to—due to her own fault. Along with the accusations, entirely plausible, her speech included passages that evoked laughter. For example, she assured those gathered that the United States is closing "hundreds of stations," but it later turned out that "someone" had copied this figure

from KROKODIL for her. She demanded an explanation of why the "eight rules of MAGATE" are being violated in the construction of the Crimean AES, yet was unable to say just what these "eight rules" were.

Locking up the debates on constructing the Crimean AES, Academician Ye. Velikhov talked about the work of the committee that tested the seismicity of the region of the station's construction. In his words, the committee concluded that the seismicity there should not be rated at 7, as before, but at 9 points (plus 1 point for flooding), whereas the plant's entire design was calculated using the first figure. At the same time, the committee, forced to rate the seismicity "at the maximum" with a reserve, noted the low reliability of its own rating—the more accurate determination of seismic danger was prevented by imperfect equipment, a scanty knowledge of the seismic history of the Crimea, and other things. Therefore, a competition was announced among Western companies which work in seismology and the construction of nuclear power plants. The two companies which won are presently doing seismic research on the construction region and are checking the correctness of the design decisions. According to their contracts, they will announce their conclusions to us after 1 year, and then the fate of the Crimean AES will be definitively solved.

Others, basically more moderate, spoke, striving for a dialogue and mutual understanding. They not only tried to examine the essence of reciprocal claims, but also to determine the opponent's position, to understand the nature of the opposition between the "greens" and the "reds."

Just what are they—the "reds" in the eyes of the "greens," and the "greens" in the eyes of the "reds"? Psychologist A. Asmolov partially answered this.

In the eyes of the "greens," a nuclear power worker is a sexless, race-less creature, concerned only about his technologies and not thinking about people at all. To add to this characterization, he is motivated solely by departmental interests, for the sake of which this creature is ready to lie, to lose his scientific reputation, and even to commit ecological suicide. In short, one cannot have a grain of trust in the "reds:" they dream only of tricking us. (I will not conceal the fact that I intentionally enhanced the colors in Asmolov's definition—not too much, I hope, to give a more accurate understanding of the opposition that has formed).

In Asmolov's opinion, the "greens" are people who, as opposed to the "reds," assess the situation reasonably, try to prevent problems through existing methods, and await a miracle. They have an entirely different consciousness, an entirely different set of axioms. They decisively and uncompromisingly oppose nuclear power and, regardless of consequences, demand its complete prohibition. They are not interested in alternatives.

When they are asked what to replace a nuclear power plant with, they suggest things long ago rejected, and when they are told that this was rejected, they do not believe or do not listen.

At A. Asmolov's request, the following experiment was performed in a number of Moscow-area kindergartens. Children ages 5-6 were given paper and pencils and asked to draw how they imagine a nuclear power plant. In all of the drawings, dark colors predominated and numerous rockets and bombs bristled along various sides. Even among 5-year olds, nuclear power plants are associated with fear and cold. In France, this experiment had an entirely different result—the children drew flowers and used virtually no dark colors. A. Asmolov believes that, whereas in distant days there were witch hunts, and in recent times—hunts for enemies of the people, in the near future we can expect hunts for "reds." Nuclear physicists, he said, are the potential "witches" of our day.

There is a share of truth, and even a fair amount, in the psychologist's words. However, after him, I. Garasevich, a doctor from Nikolayev, asked for the floor and made some corrections in the characterization of the "greens." "I am not against nuclear power," he said, "I am against the imperfection of its technologies. I am against the kinds of nuclear plants they are building here and the way they are building them." He presented the meeting with a list of the rules, laws, and agreements, violated in the construction of the South Ukraine AES. These include the sanitary rules for the design, construction and use of water reservoirs, the requirements for the location of the AES, the UkSSR Water Code, as well as the Forest Code, and even the 5th International Convention on Trade in Wild Species of Flora and Fauna. Garasevich demanded the introduction of more economical, improved and, what is most important, existent technologies for the accumulation and selection of energy. He presented the scientists with proposals by specialists from Nikolayev: these proposals are, it seems, being given the proper attention. The imperfect technologies and constant violations of rules, and not prejudices, are the true barrier encountered by nuclear power in its own, no longer triumphal, march.

I. Garasevich brought 200,000 signatures to Moscow from the people of Nikolayev, requesting a halt to the construction of the AES in South Bug Canyon. In particular, he expressed doubt: the November 1987 issue of *ATOMNAYA ENERGIYA* reported the fact that 90 percent of the electrical energy obtained from the South Ukraine AES is sent to Romania and other socialist countries. "Should we pay for this," he said, "with our South Bug?"

We would not have started focusing the readers' attention on this episode of the discussion, the more so since the "greens," as practice shows, are often mistaken, except that none of those who spoke later repudiated the Nikolayev doctor's report, and no one answered his

point. True, one of the opponents accused I. Garasevich of regionalism, and another edifyingly remarked that "we should not forget the seriousness of obligations to our neighbors." This answer cannot be satisfactory.

We did not find references to 90 percent in the indicated journal, but we did find the article which, apparently, I. Garasevich had in mind (B. Kuvshinnikov, A. Petrosyants, and B. Semenov, "The USSR's Experience in International Cooperation in World Use of Nuclear Power"). It says:

"Several CEMA countries are participating in the construction of nuclear power plants within the territory of the USSR on a compensatory basis. A typical example is the participation of Hungary, Poland and Czechoslovakia in the construction of the Khmelnitskiy AES, with a capacity of 400 MWt, on the basis of an agreement concluded in 1979. According to the agreement, after the commissioning of the first block of the AES, the USSR will provide electrical energy to these countries over 20 years in volumes proportional to their contribution to construction. In connection with this, as of 1990 the annual deliveries of electrical energy to the countries that participated in the agreement will be equivalent to commissioning one AES energy block apiece in each in these countries, with a capacity from 400 MWt (in Hungary) up to 1,000 MWt (in Poland).

"...Through the joint efforts of Rumania and the USSR, the South Ukraine AES is being built in the Soviet Union, electrical power from which is sent to Rumania and Bulgaria along specially designed transmission lines. More than one-half of the installed capacity of this AES... will ensure export deliveries of electrical power, equivalent to building three blocks with a VVR-440 [water-moderated water-cooled reactor] in Bulgaria, and two such blocks in Rumania.

"This approach to cooperation in the construction of an AES has its advantages: it considerably expands the possibilities for selecting a site for the AES and removes concerns from the countries which receive electrical power (singled out by me—V.P.), related to using an AES, including the delivery of fresh nuclear fuel, storage, transportation, reprocessing used fuel, and the processing and disposal of radioactive wastes."

What "advantages" they propose for us! We share the Nikolayev doctor's alarm and doubt, and hope to obtain a satisfactory answer, from persons competent in power engineering, to the question: "What will the ecological situation be in the South Bug, in connection with the construction of the AES? For whom is it being built? Has the energy policy in this respect changed since 1987, and will we tempt our neighbors with the "advantages" of such cooperation in the future?"

Finally, it became clear: the "greens" fear the further development of nuclear power engineering, because, in their opinion, it leads to a subsequent ecological or

radiation Chernobyl. Therefore, it must quickly be prohibited. The "reds" are less frightened by Chernobyl, see no alternatives to nuclear power in immediate decades and, in the event of a rejection of nuclear power, predict an unprecedented energy shortage. Our civilization has not yet experienced a catastrophe of this nature, and therefore it does not seem so terrible for the time being. Possibly, however, this could be worse than Chernobyl.

A. Makarov, USSR Academy of Sciences corresponding member (interviewed by NTR, No 4, 1989), expressed the fear that the closed Armenian AES may cause great complications in the power supply for the Trans-Caucasus by this fall. After stipulating that these are his personal assessments, he declared that the situation may turn out to be even more serious, than that in Siberia in 1983. At that time, due to an unbalanced regional power policy, a strong trend toward building a GES, and the complete—in the course of 20 years—rejection of new heat stations, many aluminum enterprises had to be closed and everyday energy consumption was restricted, in particular, street lighting was turned off in urban regions. In A. Makarov's opinion, the situation may be even more serious in the Trans-Caucasus: there are relatively few industrial enterprises there, and therefore the basic weight of energy regulation lies on the population's shoulders. The power corrections now being carried out are called upon to lessen the shock, but very little time—a few months—remains for their implementation.

Incidentally, we do not yet know all of the consequences of Chernobyl. Possibly, its sociopsychological effect will end up being more serious than the medical or ecological effects. Today, it is already obvious that faith in the scientist, in the correctness of his judgments, has been lost and will scarcely be restored rapidly. For a society, from which information was hidden for decades, which suddenly comes face to face with a catastrophe which (as they assured us) was not at all possible, it is hard to remain as trusting, as before. Hence, apparently, the extreme nature of opinions and the mutual lack of acceptance. The physicists, it seems, have found a real solution to the situation—a discussion club for everybody. The discussions are open to anyone. It (at least, so I hope) will help overcome the confrontation between the "greens" and the "reds," and will help both evaluate the situation more correctly.

Not long before this conference, an opponent of the AES called the editors. When we suggested that he speak out with his protest at the nuclear power workers' club, he refused. Why, he said, crawl into a "wolves' den." So, respected "greens," as both conferences have shown, the discussion club is not a wolves' den at all. They are waiting for you. They want to listen to you, not in order to beat you over the head with arrogance, but in order to listen and find a common language with you. Of course, arguments should be correct, and objections—substantiated.

Moreover, as we see, there were plenty of discussions at the club. "We had no opponents at the first meeting," said the permanent leader of the club, Academician N. Ponomarev-Stepnoy. "Now, opponents have appeared and the auditorium is not big enough."

Production of Dosimeters for Public Use Urged
18140251b Moscow ARGUMENTY I FAKTY in
Russian No 18, 6-12 May 89 p 4

[Article by Academician of the USSR Academy of Medical Sciences L. Buldakov; first three paragraphs are ARGUMENTY I FAKTY introduction]

[Text] "Do we have personal dosimetric devices for the population and when will their production in sufficient quantity be organized?"

[Signed] N. Tkachenko, Kiev

Academician of the USSR Academy of Medical Sciences L. Buldakov answers the question.

Personal dosimeters, which are specially intended for the population, exist in a number of countries, for example, the United States and Japan. In our country so far only developments of similar devices exist. But they are not being produced by industry, inasmuch as prior to the

accident at the Chernobyl Nuclear Electric Power Plant the opinion that the population does not need dosimeters predominated in our country.

Now industry is producing only collective-use devices. These are the DKS-04M and DRG-01T dosimeters, which make it possible to measure the radiation level accurately. It would also be advisable to increase their production. They cost 250-300 rubles, and schools, enterprises, brigades, and so on can purchase them.

We believe that personal devices of two types are needed. The first is "blind" dosimeters, which merely accumulate indications of gamma-ray emissions. These devices are small in size; they are attached to the clothing; it is necessary to wear them constantly. In order to measure the received dose of radiation, it is necessary periodically—approximately once a quarter—to turn to the nearest personal dosimetry center. A network of these centers has already begun to be set up. But several years will be needed for its supply with the necessary equipment. Series-produced personal dosimeters will cost 2-3 rubles, the cost of measurement is about 1 ruble.

Devices of another type—indicators of the level of radiation—are also necessary. In accordance with them, it is possible to evaluate promptly the radiation conditions. Such indicators also show the contamination of food products. It is possible to set up the production of the indicators in 1-2 years. The probable price of such a personal device is about 30 rubles.

Kotlyakov Interview on Arctic Scientific Research Conference

18140252 Moscow PRAVDA in Russian 9 May 89 p 2

[Interview with Corresponding Member of the USSR Academy of Sciences V. Kotlyakov, general secretary of the organizing committee of the Conference of Arctic States on the Coordination of Scientific Research in the Arctic, and Doctor of Geographical Sciences G. Agranat, Vice President of the USSR-Canada Society, by Candidate of Geographical Sciences D. Oreshkin under the rubric "Ecology: Hot Spots": "The 'Tropics' of the North"; date and place not given; first two paragraphs are PRAVDA introduction]

[Text] The Conference of Arctic States on the Coordination of Scientific Research in the Arctic was held in Moscow.

Corresponding Member of the USSR Academy of Sciences V. Kotlyakov, general secretary of the organizing committee of the conference, and Doctor of Geographical Sciences G. Agranat, vice president of the USSR-Canada Society and an expert on problems of the foreign North, talk about the problems of developing the North.

V. Kotlyakov: It seems to me that the decades of semi-official fervor have eroded in us the sense of geographical reality. We actually "live without feeling the country under us," without realizing how rich it is in...cold. The North takes up half of the territory of the Soviet Union—11 million square kilometers. While the total area of the entire foreign North, including Alaska, Iceland, Greenland, and so on, is only 9.5 million square kilometers. There live there 2.5 million people. In our country nearly 11 million people do.

In the scientific respect we were still recently recognized as the leaders of studies of the North, Canadians and Americans studied here. But now in many respects they have the initiative, and the interest in developing the northern expanses abroad is increasing rapidly.

G. Agranat: From an economic point of view the North is two-faced. At first glance, it is very inexpensive. According the standards and methods, which are common for the entire country, a hectare of tundra or forest tundra "is worth" not more than 10-100 rubles. What is there—breeding sites of barnacles, deer pasture, and weak little trees. Perhaps, there are also cranberries. The products are worth next to nothing. For comparison: a hectare of Kursk black earths is worth 15,000-20,000 rubles. Hence, the sanctions for the destruction of northern nature are very small. This decreases appreciably the costs of development. But no one is considering the harm that has been done to the biogeochemical equilibrium. For the North along with the tropics serves as the lungs of the planet. I am convinced that it is necessary to

change radically the system of evaluating high-latitude areas and to bring their price in line with the role that they play in the support of life on earth.

V. Kotlyakov: In the foreign North the legislator gives clear formulations. In summer it is possible to travel in heavy all-terrain vehicles only through strictly designated corridors; during the period of seasonal migrations of deer and the nesting of birds in specific regions the movement of transport, including low-flying airplanes, is prohibited altogether; in case of the construction of pipelines, taking into account the vulnerability of northern nature, a right of way, which is half as wide as in the temperate zone, is established. In our country the altogether good Ukase of the Presidium of the USSR Supreme Soviet on strengthening the protection of nature of the Far North was also promulgated. But they buried it in the departmental maze.

I believe that we need precisely a territorial, that is, a geographical basis of actions, which is based on a knowledge of the economy, people, and nature of the North. For example, very large territorial production complexes, which are efficient in the temperate latitudes, here in principle do not justify themselves. Decentralized is required.

G. Agranat: Since the Murmansk speech of M.S. Gorbachev the northern world has been looking to Moscow. Everyone understands that the USSR has the key positions here. They are expecting from us the discovery of a Northern Sea Route for world trade—with a great advantage for the Soviet Union, of course. Means of sharing scientific information are being discussed. Without it both domestic and world science is hindered. The age of resource conservation is beginning and at the same time the resources of free territories and an ecologically clean environment are increasing sharply in price.

V. Kotlyakov: I would formulate my position as follows. The global role of the North is changing before our eyes. At the same time the threat of losing forever this last ecological and territorial reserve is growing. We need a new concept of the use of northern lands. Until it exists, it would be better to focus attention on the revival of the Center, the same Nonchernozem Zone, and in the North to moderate departmental activity. I do not doubt that such an approach will evoke the protest of many ministries. For them the North is one of the last opportunities to assimilate billions of rubles of investments and to begin new giant construction projects.

But it is necessary to take a broader view. To prepare a base for advancement, to build roads and housing, to launch integrated scientific research. It is high time to revive the school of Soviet studies of the North, which is respected throughout the world. We are the world flagship in the development of the North, it is improper for us to move at random.

Regulations Governing Committee for USSR Lenin, State Prizes in S&T

18140234a Moscow IZVESTIYA in Russian
23 Apr 89 p 3

["Regulations on the USSR Council of Ministers Committee for USSR Lenin and State Prizes in Science and Technology (Approved by CPSU Central Committee and USSR Council of Ministers Resolution, 21 March 1989, No 251)"]

[Text] 1. The USSR Council of Ministers Committee on USSR Lenin and State Prizes in Science and Technology (henceforth referred to as the "Committee") is made up of a number of leading scientists and specialists, recommended by the academies of sciences, ministries, departments, associations, enterprises, scientific institutions, higher educational institutions, and public organizations and is approved by the CPSU Central Committee and the USSR Council of Ministers for a term of 3 years.

A list of the Committee members and information about changes to it is to be published in the press.

2. The Committee is responsible for:

- a) Awarding the Lenin Prizes in science and technology;
- b) Awarding the USSR State Prizes in science and technology and for textbooks;
- c) Awarding, jointly with the AUCCTU, the USSR State Prizes for outstanding achievements in labor and scientific and technical creativity to the front-ranking workers of the socialist competition;
- d) Awarding the USSR State Prizes for outstanding achievements in radically improving the quality of production and consumer goods.

3. The Committee, in conformity with the purposes of its activity:

- a) Distributes notices to well-known scientists, specialists and organizations requesting the indication of particularly outstanding works and the authors of them, who deserve to be awarded the Lenin Prize. The list of scientists, specialists and organizations to whom notices are sent is approved by the Committee Presidium;
- b) Performs the acceptance and preliminary examination of works, nominated for the USSR Lenin and State Prizes, selects the most worthy ones for participation in the competition for the prizes, publishes a list of these works in the newspaper IZVESTIYA, and organizes their public discussion;
- c) Comprehensively examines the works submitted in the competition, studies the suggestions and observations received concerning them, makes decisions about

awarding the USSR Lenin and State Prizes, and submits them to the CPSU Central Committee and USSR Council of Ministers for approval.

The discussion of the works and their authors in the Committee should be carried out under conditions of creative discussion, high exigency and principle-mindedness. In this regard, the reliability and thorough substantiation of all conclusions and results and the conformity of the works to the set requirements are subjected to mandatory analysis;

d) Draws up the diplomas, certificates and honorary medals for the Lenin Prize winner and the diplomas and honorary medals for USSR State Prize winners and organizes their delivery at a ceremonial event;

e) Pays the monetary part of the prizes to the winners;

f) Assists in disseminating the creative experience and achievements of the USSR Lenin and State Prize winners through the mass information media.

4. The Committee is granted the right:

a) To form sections and committees of experts on individual branches of science and technology for the preliminary examination of works, nominated for the USSR Lenin and State Prizes. The procedure for the work of the sections and expert committees is determined by regulations, approved by the Committee Presidium;

b) To submit works, nominated for the prizes, for expert examination to the academies of sciences, ministries, departments, associations, enterprises, scientific institutions, and higher educational institutions. Scientists and specialists of the national economy may be employed to review the works, nominated for prizes. The procedure for reviewing works is established by the Committee Presidium.

The labor of the employed scientists and specialists, as well as that of the scientific secretaries of the Committee sections, is paid for according to rates, coordinated with the USSR Ministry of Finances;

c) To send Committee members and experts or expert committees on site for familiarization with the results of the works under examination and with the competitors' creative contribution. Expenses for the business trips of Committee members and experts are paid for according to existing legislation, within the limits of the established estimate;

d) To implement control over the observance of the set procedure for the nomination and expert examination of works, submitted for the USSR Lenin and State Prizes.

5. The committee's work is directed by an 11-member presidium headed by a chairman. The committee structure includes 3 departments: natural sciences, the humanities, and technology, each numbering up to 30 people. Committee members may participate in its work for no more than 6 years.

Decisions to nominate a work to compete for the USSR Lenin and State Prizes and decisions to award the prizes are made in the departments by secret vote. In order to nominate a work for the competition, it must collect at least one-half of the votes, and in order to award the prizes—at least three-quarters of the votes from among those present. Department meetings are considered competent given the presence of no less than two-thirds of the members.

The decision to award the USSR State Prizes for outstanding achievements in labor and scientific and technical creativity to the front-ranking workers of the socialist competition is made jointly by the AUCCTU and Committee presidiums.

The decisions to award the prizes go into effect after their approval by the CPSU Central Committee and the USSR Council of Ministers. The CPSU Central Committee and USSR Council of Ministers resolutions are published in the press within the time periods, established by the regulations on the USSR Lenin and State Prizes.

6. The Committee carries out its practical activity with the assistance of an apparatus, led by a scientific secretary who is designated by the USSR Council of Ministers.

The structure and number of staff workers for the Committee apparatus are approved by the USSR Council of Ministers.

7. The Committee has a seal and account with the USSR Zhilsotsbank.

Regulations Governing USSR State Prize for Science, Technology

18140234b Moscow TRUD in Russian 22 Apr 89 p 2

["Regulations on the USSR State Prize in Science and Technology (Approved by CPSU Central Committee and USSR Council of Ministers Resolution of 21 March 1989, No 251)"]

[Text] 1. The USSR State Prize is awarded:

- For scientific research which makes an outstanding contribution to developing the humanities and natural and technical sciences, leading to a significant acceleration in the country's economic and social

development, to the solution of common human problems, and to bringing Soviet science and technology up to the level of advanced world achievements;

- For obtaining outstanding results in implementing the projects of state scientific and technical programs;
- For developing and applying new types of equipment, materials and technologies at the level of the best, in terms of their indicators, similar world models, ensuring an increase in the rates and efficiency of development of the economy, as well as for creating resource-conserving and ecologically clean technologies and strengthening the country's defense capability;
- For outstanding achievements in radically improving the quality of production and consumer goods;
- For the best textbooks, which have received extensive public recognition, for higher and secondary specialized educational institutions, secondary general educational schools, trade and technical schools, and for the political and economic education system for workers;
- For outstanding achievements in labor and scientific and technical creativity to the front-ranking workers of the socialist competition—workers, kolkhoz workers, engineering and technical employees, and specialists.

2. Scientific works and textbooks, nominated for the USSR State Prize, should be published in the press at least a year before awarding them a prize, and new kinds of equipment, materials, and technologies should be assimilated in the national economy.

3. The USSR State Prizes are awarded annually in a quantity of:

- Up to 18 prizes for works in science and technology, including up to 7 prizes for works in the natural sciences, up to 5 prizes for works in the humanities, and up to 6 prizes, in technology;
- Up to 5 prizes for outstanding achievements in radically improving the quality of production and consumer goods;
- Up to 3 prizes for textbooks;
- Up to 15 prizes for outstanding achievements in labor and scientific and technical creativity by the front-ranking workers of the socialist competition

The amount of the prize is 10,000 rubles each.

4. The nomination of works for the USSR State Prize in science and technology is done by the presidiums of the academies of sciences, of scientific and scientific and technical societies, the collegiums of ministries and departments, the scientific and scientific and technical councils of associations, enterprises, scientific institutions, and higher educational institutions, and by meetings of the labor collectives of enterprises, institutions, and organizations.

Work to radically improve the quality of production and consumer goods is nominated in accordance with the USSR State Committee on Standards.

Work for outstanding achievements in labor and scientific and technical creativity by the front-ranking workers of the socialist competition are nominated by the presidiums of trade union central committees, jointly with the corresponding ministries or departments.

Candidates for the group of competitors are selected by secret vote from among those authors who have made the most creative contribution to the fulfillment of the work. The candidacy of each aspirant should undergo public discussion in the labor collectives at his place of work.

The nomination of works for the prize and of the group of candidate competitors should occur in an atmosphere of high exigency in evaluating the work and the creative contribution of each candidate competitor, with society's broad participation and provision of glasnost.

It is not permitted to nominate works for the USSR State Prize, which are worthy of (or nominated for) the Lenin Prize, the USSR Council of Ministers Prize, or the State Prize of a union republic.

5. The group of competitors, nominated for a USSR State Prize, cannot exceed 8 people.

The group of competitors, nominated for a USSR State Prize for outstanding achievements in labor and scientific and technical creativity, cannot exceed 10 people.

It is not permitted to include persons in the group of competitors:

- only on the basis of administrative, consultative and organizational activities;
- who have won a state award for this work;
- included in the group of competitors for another work, nominated for a Lenin Prize, USSR State Prize, USSR Council of Ministers Prize, or the State Prize of a union republic.

Given the existence of new great achievements by a USSR State Prize winner, he can win this prize again, but receipt of a subsequent prize can occur no sooner than 5 years after the previous award.

6. The group of competitors can include persons who are not citizens of the USSR, who have done work on plans and programs jointly with USSR organizations and have been nominated by these organizations.

7. Works, nominated for the USSR State Prize, are accepted by the USSR Council of Ministers Committee on the USSR Lenin and State Prizes in Science and Technology (henceforth referred to as the "Committee") annually until 1 December, and work on outstanding achievements in labor and scientific and technical creativity by the front-ranking workers of the socialist competition—annually until 1 April.

The procedure for nominating works and drawing up the documents is determined by instructions, approved by the Committee Presidium.

8. The Committee examines works, nominated for a USSR State Prize, in two stages. In the first stage, works are selected for participation in the competition, and in the second—a decision is made about whether to award the prizes.

9. In order to extensively familiarize society with the works, allowed to participate in the competition, a list of them indicating the authors and the organizations that nominated said works, is to be published by the newspaper IZVESTIYA in March; and—for outstanding achievements in labor and scientific and technical creativity—in the newspapers IZVESTIYA and TRUD in May.

10. Works, participating in the competition for USSR State Prizes, should be comprehensively and fundamentally discussed in the press and on television and radio, at the meetings and conferences of scientific and scientific and technical societies, at conferences of scientists and scientific and technical councils, and in labor collective meetings. The discussions should be open and should openly reveal the opinions and assessments of the broad public.

The conduct of the discussion is to be organized by the editorial boards of newspapers and magazines, by the USSR State Committee on Television and Radio Broadcasting, and by leaders of associations, enterprises, scientific institutions, higher educational institutions, scientific, scientific and technical societies and public organizations. Documents from these discussions, and opinions, reviews, observations and suggestions are accepted by the Committee until 1 June, and are taken into consideration when making the decisions to award prizes.

11. The decision to award the USSR State Prizes in science and technology is made by the Committee and presented to the CPSU Central Committee and USSR Council of Ministers before 1 October.

The decision to award the USSR State Prizes for outstanding achievements in labor and scientific and technical creativity is made jointly by the Committee and AUCCTU presidiums, and is presented to the CPSU Central Committee and USSR Council of Ministers before 1 October.

Decisions to award the USSR State Prizes enter into effect after their approval by the CPSU Central Committee and USSR Council of Ministers. The CPSU Central Committee and USSR Council of Ministers resolutions on awarding USSR State Prizes are published in the press for the anniversary of the Great October Socialist Revolution.

12. Persons, awarded the USSR State Prize, are granted the title "USSR State Prize Winner," and are given a diploma and honorary medal at a ceremonial event. When awarding the prize to a group of authors, the monetary part of the prize is divided equally among them.

13. The diploma and honorary medal of a deceased USSR State Prize winner, or a prize awarded posthumously, are left or transferred to his family in his memory. The monetary part of the prize is transferred by inheritance, according to the procedure stipulated by civil legislation.

Georgian Academy President Profiled
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[Article by Galina Kharebashvili under rubric "The New Makeup of the Georgian SSR Academy of Sciences Presidium": "Last Chance for the Future. The Academy of Sciences Today and Tomorrow... and Some Lines from a Portrait of Its President"; first three paragraphs are editorial introduction. Passages in boldface as published]

[Text] Ongoing processes of perestroyka in our country—democratization and glasnost—are confronting science with completely new tasks. Here is how things stand today: "The topic on the agenda is to increase the real payback of Soviet science. We ought not to make a single decision with regard to politics, the economy, management, or the ecology without serious scientific substantiation and scientists' objective appraisal" (CPSU Central Committee Appeal to the Party and the Soviet People, 10 January 1988). The new, different requirements of the effort necessitate this kind of approach. There is no alternative: It is essential to totally rejuvenate activities, scientific work, and thinking. This also has to do with fundamental problems of the Academy and necessitates a dramatic improvement in the scientific-organizational work of its institutes.

Last summer, the Georgian SSR Academy of Sciences held elections to choose full and corresponding members of the Academy, and the makeup of the Presidium was entirely renovated; the vice presidents, academic secretaries, and institute directors are all new. Every sector has worked out its own plan of action.

The editors have decided to acquaint readers with the new members of the Presidium. This first article will be about the President of the Academy and, accordingly, all the activities and prospects of the Georgian SSR Academy of Sciences as a whole.

It used to be that geniuses created miracles in their labs, startled their contemporaries with discoveries of the century, and brought light to a world shrouded in darkness.

The specifics of endeavor today have changed character, as in almost all other aspects of our life, and that goes for science too: It has become a collective effort. Particular problems are worked on by institutes, themes are worked out on a group basis, and so on.

The new way of thinking, the new approaches to problems, are not just something journalists have dreamed up; they are urgent and vital requirements of the time. In the second half of the 20th century, mankind has made giant strides along the path of progress. Our country, now free of the swamp of stagnation, must keep pace

with this process. This is actually an enormous task, magnificent in terms of its character and scale, the successful accomplishment of which will determine our future.

The 20th century has been called an era of reason and rationalism, and with good cause—the element of risk in every step that is to be taken, every decision, requires an abundance of scientific calculation (especially considering how much has been lost). It is not by chance that the introduction to this article includes a quotation from the CPSU Central Committee's appeal. Competent scientific assessment, mathematical accuracy in all spheres without exception, whether the humanities or the technical sciences. The universal nature of this requirement defines both the areal extent and the specifics to be accomplished.

The Georgian Academy of Sciences has always had good luck with its leaders. Just look at the list of the names of former presidents: Nikoloz Muskhelishvili, Ilia Vekua, Evgeni Kharadze....

As is well known, the job of heading the Academy of Sciences is one of great honor and great difficulty. The honor comes as a matter of course, for the leadership of a corps of scientists must be earned. It is not easy to win authority. The difficulties, on the other hand, derive from many things. Above all, probably, the fact that it is not enough just to have the essential talents of a true scientist.

When Christiaan Barnard performed the first human heart transplant 20 years ago, our country's eminent scientists were amazed at how well things were organized in the clinic. They were less interested in the marvelous equipment used for the heart operation than in how the job was organized. They saw that such a big leap could be made only on the basis of precise organization. That's how much importance the most brilliant leaders in the field attach to the proper organization of their own work.

"In Albert Tavkhelidze we have not only a great scientist and an outstanding researcher in theoretical physics but also an experienced organizer in the sciences"; this is the general assessment of President Tavkhelidze in the republic's scientific circles.

To be more specific, however....

A few highlights from his biography:

At age 27, a candidate of science. At age 33, a doctor. At 37, a corresponding member of the Academy. At 44, an academician and winner of the State Prize and the Lenin Prize.

A couple of words about him as a scientist:

The study of the microstructure of the universe has always been one of the most interesting endeavors of mankind, one which has always been characterized by revolutionary discoveries that have had a decisive impact on the development of various branches of science.

In the 1950s, the study of the properties of the fundamental nuclear particles (protons, neutrons, and mesons) and attempts to explain the secrets of nuclear forces came to be of exceptional importance. In this line of endeavor, determining the general laws governing the interaction between electromagnetic waves and nuclear particles came to be one of the prime goals. To describe these laws, whose properties had already been studied by academicians N. Muskhelishvili, I. Vekua, and their students, A. Tavkhelidze in 1958 made use of singular-integral equations.

Elaborating upon his work, in order to describe the interaction of nuclear particles A. Tavkhelidze introduced the concept of the generalized potential and defined the equations which are known in the world literature as the Logunov-Tavkhelidze Equations.

On the basis of numerous experimental and theoretical investigations, it had become clear by 1964 that protons, neutrons, and other nuclear particles are not the smallest particles in nature, and that they consist of what are known as quarks. Academician N. Bogolyubov and A. Tavkhelidze expressed the conjecture that quarks carry a specific charge—a colored/chromatic charge, and this serves as the basis for the colored/chromatic quark model of the structure of matter today. On the basis of the colored/chromatic quarks hypothesis, A. Tavkhelidze and his students determined the most general laws governing the interaction of nuclear particles, laws which in the literature go by the name of quark-counting formulae. The defining and experimental confirmation of these formulae serve as the most convincing substantiation of the existence of quarks. These laws were registered as a discovery in 1987, and in 1988 A. Tavkhelidze and his colleagues and students were awarded the Lenin Prize for their cycle of studies titled "A New Quantum Number—Color and the Determination of Dynamic Laws in the Quark Structure of Elementary Particles and Atomic Nuclei."

As an educator:

Quite often, great researchers and major specialists are gently chided for failing to leave behind them persons worthy to carry on their work. But here's what they say about Albert Tavkhelidze: "I consider myself fortunate to have worked by his side for many years. These have been unforgettable years. To his pupils, students, and co-workers, he is more than a leader; he is an older friend, a teacher and mentor in the lofty, true sense of those words.

"Many scientists have been trained under his guidance. I can state in all sincerity that I am in the service of science today basically thanks to Albert Tavkhelidze. And the fact that I am carrying on his work is a great honor to me." These are the words of Professor Viktor Matveyev, the director of the USSR Academy of Sciences Nuclear Research Institute, which A. Tavkhelidze headed for many years.

Not just a "great scientist and researcher but also a good and experienced organizer of the sciences..."—in these circles, such a characterization is not given out lightly. After completing his graduate studies in Moscow, Albert Tavkhelidze was kept there. More than three decades passed after that. If a particular interval in time is to be measured by the things that have been accomplished in the period, then those 30 years add up to much more than just three decades in one man's life. He was directly involved in the creation of the Dubna Unified Nuclear Research Institute's Theoretical Physics Institute, the Serpukhov High-Energy Physics Institute, and the Kiev Theoretical Physics Institute. He was also one of the organizers who founded the journal *TEORETICHESKAYA I MATEMATICHESKAYA FIZIKA*. A. Tavkhelidze was directly involved in establishing the USSR Academy of Sciences Nuclear Physics Institute, which he served as director for 17 years; he is presently its science head [uchenyy rukovoditel]. All that time, he was never out of contact with Georgia: Georgia's world-renowned school of high-energy physics was formed under his direct supervision.

The selection of Albert Tavkhelidze to serve as the President of the Georgian SSR Academy of Sciences coincided with a very difficult and interesting period—the process of perestroika in the country was just getting underway. At that time a decree was passed which took away the right of anyone over the age of 75 to hold a supervisory position in science. It became necessary to rejuvenate the Presidium as a first order of business. This extremely important task, which could not, of course, be accomplished overnight, would fundamentally determine the fate of perestroika in our republic's overall scientific endeavor. Of the available possibilities in this regard—that is, the cadres, the optimal variant was chosen; such is the assessment of this campaign in scientific circles.

Today, the Georgian SSR Academy of Sciences is engaged in big doings. Naturally, its activities are closely linked to the work of the USSR Academy of Sciences, which has determined and mapped out lines of top-priority fundamental research and drawn up all-union academic programs. (Let us note here, by way of definition, that these programs are designed essentially to deal with the country's most urgent problems on today's level of science and technology.) The programs call for maintaining our lead positions in the world in branches where our leadership is not subject to doubt, and overcoming our lag in branches of science which have so far been given less attention. So much for fundamental science.

On the other hand, in order to advance those sectors of production for which the results of scientific-technical progress are vitally essential, USSR Gosplan and the USSR Academy of Sciences have worked out 14 state scientific-technical programs in accordance with a decree of the USSR Council of Ministers.

The Georgian SSR Academy of Sciences Presidium and its scientific-research institutions have taken active part in drawing up programs of both types, with the result that a number of lines of endeavor in branches of the natural, technical, and social sciences—lines of research in which the scientific institutions of the Georgian SSR Academy of Sciences will play a leading or substantial role—occupy a place of prominence in all-union programs of fundamental research.

For example, a definite contribution will be made to the implementation of very important programs by the A. Razmadze Mathematics Institute, the Physics Institute, the Cybernetics Institute, the Metallurgy Institute, the Inorganic Chemistry and Electrochemical Institute, the Plant Biochemistry Institute, the Physiology Institute, the Molecular Biology and Biological Physics Institute, the Pharmacochemical Institute, and the Machine Mechanics Institute, also by collectives of the Tbilisi State University.

These research activities will be participated in by the Control Systems Institute, the Physical and Organic Chemistry Institute, the Physiochemical Institute, the Experimental Morphology Institute, and the Geology Institute, according to profile.

On the basis of preliminary contest scores, moreover, our Academy's institutes will be taking part in implementing 16 out of the 18 programs of fundamental research mapped out by the USSR Academy of Sciences.

But why is it so important for the republic's scientists to take part in state scientific-technical programs and the Academy's program to develop the fundamental sciences, and why has the new President focused so much attention on these matters?

On the one hand, participation in the programs constitutes an acknowledgment of the quality of science in the republic, which is a matter of considerable prestige. On the other hand, there is the practical aspect: It is an effective way to obtain financing. The fact is that the implementation of perestroika in science embodies a very important innovation—namely, the fact that the "base" financing of academic institutes is being replaced by competitive program financing, and this means that winning in competition and taking part in practical program implementation provide a partial solution to the problem of financing the institutes.

Participation in several all-union state programs in the past two years has already enabled the Academy to double the financing of gear and equipment. This has

made it possible to satisfy the various academic institutes' requirements in medium-capacity computers. They have acquired about 100 minicomputers and PCs. It must be said, however, that this is not enough to meet the institutes' computer requirements. They will need at least 500 more computers and PCs.

One detail: For taking part in 16 programs this year, the Academy was allocated approximately five million rubles, which adds up to only 12 percent of its financial needs. Hence, the collectives of the Academy's scientific institutions will have a very hard time supporting themselves under conditions of anticipated program financing. For this reason, integrated republic-level fundamental research programs (similar to all-union programs) should be set up in addition to the integrated "Georgia: Science, Technology, Quality-90" Program, which would have the character of a state order, with appropriate financing and equipping on the republic level. The Academy has been working on compiling these programs for some time and will soon submit them to the appropriate organs for consideration.

Life in our country today, the revolutionary processes taking place, have immeasurably enhanced the role of the humanities and their influence on society.

Further progress requires an objective study and elucidation of the country's history. A decisive role in this is assigned to scientific historians and philosophers who must analyze the most important events of modern history on the basis of a scientific study of historical facts. The Academy is placing great emphasis on work along these lines.

The historic process of perestroika is based entirely on making maximum use of human possibilities. That is why the human factor has become so paramount. One of the fundamental tasks of the social sciences will be to find ways to enhance the role of this factor in a developed society.

The creation of a state of law and the development of a new system for the management of economic processes have assigned new, greater tasks to legal experts, economists, and appropriate institutes.

Today, when glasnost has abolished all zones forbidden to discussion and criticism, the people's interest in the political and economic processes taking place in society has increased greatly. Under such circumstances, scientifically substantiated recommendations alone will serve as a reliable means. Only in this way will a persuasive dialogue be possible with the broad masses of society. This, too, places greater responsibility on our social scientists in these times.

One of the main problems the newly chosen President has focused on from the very start is computerization. The 16 million rubles' worth of computers which have been acquired in the past two years are by no means

enough. In the future they intend to install a collective-use automated system for the Academy Presidium which will in effect result in paperless operations. Any document—whether routine incoming data or scientific matters—will be machine-processed in such a manner that, when the need arises, it will be right there at hand, so to speak.

Plans also call for the extensive use of computer technology in the social sciences and the humanities, and extremely interesting work is already underway.

Dialogue with computers in the Georgian language is an essential condition for the further development of the language and exploration of its treasures. A general concept oriented toward the creation of a unified automated system has already been worked out. A scientific-practical seminar has been set up, based in the Academy's Scientific-Information Center. The seminar is participated in by staff scientists of the Manuscripts Institute, the Oriental Institute, the History, Archeology, and Ethnography Institute, the Linguistics Institute, the Georgian Art History Institute, the State Museum, and the People's Friendship Museum. Georgian display and printing fonts have been developed, making it possible to input Georgian text into the computer. Also underway are efforts to work out a Georgian dialogue system for PCs and create an automated system for the Academy's publishing activities.

In general, achieving substantial scientific results, training science cadres, and working effectively will greatly depend on outfitting the institutes with modern equipment and computer technology. To cope with this task as efficiently as possible, the Academy has created a scientific-technical council for computer technology, mathematical modeling, research automation, and scientific instrument-making, and they are placing great hopes on it.

Our country is now past the talk stage. It is time for action; we have no more time to talk. In this regard, President

Tavkhelidze is a true child of his time. He doesn't like excessive talk, only about business! No departures from the subject at hand or lyrical digressions.

For example, he considers it a waste of time to talk about the past, about what has already been accomplished. That's yesterday's news. The main thing is the task which we still have to do, the things required of us today, the duty we owe to the future. The main thing is the problem of scientific cadre training, which is of such urgency today. The number of young doctors of science can be counted on your fingers. Moreover, because we have so few holders of the doctorate under the age of 50, candidates for institute directorships have to be chosen from among persons over 60. There are many problems. As a candidate for USSR people's deputy, he has thought a great deal about them and mapped out a program. He knows that it will take a great deal of energy to resolve them.

Sometimes it seems to me that perestroika is the last chance for tomorrow, that to even assume an alternative—either yes or...—is the same as sentencing oneself to death. Thinking in the new way just for the sake of journalism will not help matters; it needs to be backed up and reinforced by concrete efforts. In fact, we need a great many more of the kind of men, the kind of leaders, who prefer deeds to words, who believe that time and energy spent in talking and paper shuffling are wasted, for whom the new way of thinking is not just pro forma but an organic trait, a vital need, people who really believe in tomorrow. Then there will be no need for an alternative to perestroika.... But let us return to the Academy. Here is what President Tavkhelidze has to say: "We have many difficulties and concerns in our work, but our many years of experience, our great potential, and our abundant traditions encourage me to believe that the republic's Academy of Sciences will have the ability to deal with the complex problems facing it." That's how the people in the Academy see the future.

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